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HOUSE OF LORDS

SESSION 1996-97

2nd REPORT

SELECT COMMITTEE ON
SCIENCE AND TECHNOLOGY

EU FRAMEWORK PROGRAMME
FOR EUROPEAN RESEARCH AND
TECHNOLOGICAL DEVELOPMENT

REPORT

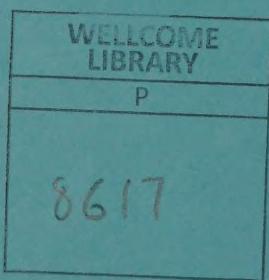
Ordered to be printed 25 February 1997

LONDON : THE STATIONERY OFFICE

£8.60

HL Paper 49

NA3



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Documents

Documents cited frequently are referred to as follows:

- Inventing Tomorrow* "Inventing Tomorrow: Europe's research at the service of its people", Commission Communication July 1996, COM(96)332, ISBN 9278-069 29-9
- Towards FP5* "Towards the Fifth Framework Programme: Additional Material for the Policy Debate", Commission Working Document November 1996, COM(96)595, ISBN 9278-11892-3
- Towards FP5 2* "Towards the Fifth Framework Programme: Scientific and Technological Objectives", Commission Working Document February 1997, printed in full with the evidence accompanying this report (see below)
- EU RTD 1996* "Research and Technological Development Activities of the European Union Annual Report 1996", COM(96) 437, ISBN 9278-08603-7
- POST* "The European Union and research", Parliamentary Office of Science and Technology (POST), October 1996, ISBN 1-897941-269

References to evidence

Q refers to a question in oral evidence; p refers to a page of written evidence. All the evidence is printed in a separate volume, HL Paper 49-I, Session 1996-97.

SECOND REPORT

25 February 1997

By the Select Committee appointed to consider Science and Technology.

ORDERED TO REPORT

EU FRAMEWORK PROGRAMME FOR EUROPEAN RESEARCH AND TECHNOLOGICAL DEVELOPMENT

CHAPTER 1 EU RESEARCH POLICY

INTRODUCTION

1.1 The Framework Programme for European Research and Technological Development is the European Union's five-year plan for expenditure on research and related activities. It embraces research to underpin EU policies, and research for the general good. Some of the research is carried out "in-house" in the EU's Joint Research Centre (JRC), and some is put out to competition between groups of researchers from around Europe; it is a fundamental condition that each group must include researchers from at least two different Member States of the EU. The Fourth Framework Programme (FP4), 1994-98, is now over half way through; it costs around 3,500 MECU (£2,520m) per year, around 4 per cent of the total EU budget (Q 323). The United Kingdom's notional contribution to the cost of FP4 is £391m for 1996-97; this may be compared with total planned Government spending on civil science and technology (including FP4) in 1996-97 of £3,785m. The Fifth Framework Programme (FP5) is now under negotiation.

1.2 If industrial competitiveness and the quality of life are to improve across the European Union, this will depend, as much as upon anything else, on scientific research and technological development. The record of the United Kingdom in research is an enviable one; our record in development and taking discoveries to market is perhaps less to be envied. The present and future shape of the Framework Programmes are therefore very important for the United Kingdom.

1.3 Research and development are central to industrial competitiveness. Europe's competitors, Japan and the USA, have acknowledged this by announcing increases in their public research budgets. The Commission's thoughtful working paper, *Towards FP5: Additional material for the Policy Debate* (p 12), concludes that "Given this outlay by our competitors/partners, we must ensure a substantial rate of investment in public and private research spending in Europe."

1.4 United Kingdom researchers have been keen participants in the Framework Programmes. In FP3 (1990-94), the United Kingdom produced more participating research teams than any other Member State (H.C. Deb. 31 January 1997 col. WA 414), and in the main areas of FP4 United Kingdom research teams are involved in over 75 per cent of projects (p 2).

1.5 Whether the United Kingdom gets out of the Framework Programmes more than she puts in is difficult to say. This is partly because the Commission publishes no figures to show receipts by each Member State, and partly because the nature of collaborative research is such that any such figures would be misleading. The Rt Hon William Waldegrave MP, then Minister for Science, told

this Committee in 1993, "We do rather well. We do not talk *juste retour*¹ in this programme but we actually do better than *juste retour*, in terms of the money that goes in through the Brussels mechanism and wins more jobs for British scientists than "technically" it should".² In evidence to this inquiry, the OST explained the difficulty of calculating a United Kingdom "balance" on Framework funding (pp 5–6). They concluded, "Estimates suggest that currently UK receipts are of the same order of magnitude as the UK's contribution to that part of the overall budget that is available to Member States" (i.e. not counting the ring-fenced budget of the JRC—see below).

1.6 The Committee last addressed the issue of European research in its report on the *European Community Fourth Framework Programme for R&D* in 1993.³ Since that time a number of significant changes have occurred which are relevant to the funding and organisation of research at both the national and European Union (EU) level. In the United Kingdom the Office of Science and Technology has lost Departmental status and been moved to the Department of Trade and Industry (DTI); the Technology Foresight exercise has attempted to put a focus on research priorities in many sectors; and there has been a series of major reviews of Public Sector Research Establishments (the 'Prior Options Reviews'). In Europe the number of EU Member States has increased to 15, with more countries keen to join; Mme Edith Cresson is now the Commissioner for research, education and training, and Professor Jorma Rautti has succeeded Professor Paolo Fasella as Director-General of Directorate-General XII (DG XII).⁴ European Union research priorities have also taken a new direction with, for example, a strong emphasis being given to the development of an information society; FP4 is halfway through, and negotiations are beginning on FP5. This report is a contribution to the debate on FP5.

FRAMEWORK PROGRAMMES

1.7 EU research policy is intended to promote the international competitiveness of European industry, to complement Member States' national research efforts and to support other EU policies. It is founded on Articles 130f–p of the Treaty of Rome, inserted in 1987 as part of the Single European Act and expanded as part of the Maastricht Treaty in 1992. It is subject to the principle of subsidiarity.⁵

1.8 EU research policy is implemented through research programmes which bring together companies, universities and research centres from different European countries in joint research projects. The research themes covered are defined in multi-annual Framework Programmes.⁶ The Framework Programmes evolved from an EEC decision in 1984 to improve the co-ordination of its research initiatives. Activities in the nuclear sector, including research into nuclear fusion at the Joint European Torus (JET), are covered by the parallel EURATOM framework programme; the two Framework Programmes are legally distinct, but are generally spoken of as one, and are so referred to in this report.

¹ The concept, frowned upon by the Community-minded, that what a Member State gets out of an EU programme should bear some relation to what it puts in.

² *Science and Technology White Paper*, 8th Report 1992–93, HL Paper 106, Q 29.

³ *European Community Fourth Framework Programme for R&D*, House of Lords Select Committee on Science and Technology 1st Report, HL Paper 5, Session 1993–94, ISBN 010–400594–7.

⁴ DGXII is the Directorate-General of the European Commission with responsibility for Science, Research and Development. Professor Fasella was the head of DGXII for 14 years until January 1996.

⁵ "The Community shall act within the limits of the powers conferred upon it by this Treaty and of the objectives assigned to it therein. In areas which do not fall within its exclusive competence, the Community shall take action, in accordance with the principle of subsidiarity, only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States and can therefore, by reason of the scale or effects of the proposed action, be better achieved by the Community. Any action by the Community shall not go beyond what is necessary to achieve the objectives of this Treaty." Treaty of Rome as amended, Article 3B.

⁶ An excellent review of the first four Framework Programmes is presented in *POST*, pp 9ff.

1.9 There have so far been four Framework Programmes, as follows:

Framework Programmes 1-4

		MECU	£m*
FP1	1984-87	3750	2212
FP2	1987-91	5396	3777
FP3	1990-94	6600	4686
FP4	1994-98	12300	9594

* At mean exchange rate of first year.

1.10 The Parliamentary Office of Science and Technology (POST) has analysed the changing priorities of the first four Framework Programmes.⁷ Energy (nuclear and non-nuclear) was the major theme of FP1, but has received a declining proportion of the Programmes which followed, whose dominant theme has been information technology. The increasing budget of successive Programmes is due partly to activities which were carried on outside one Framework being brought within the scope of the next; but, even comparing like with like, FP4's budget is 150 per cent of FP3's.

1.11 The three objectives of FP4 are:

- to develop scientific and technological excellence in Europe, with the aim of responding to the needs of industry and improving the quality of life in the Member States;
- to promote scientific and technological cooperation in Europe; to improve the coordination of research efforts undertaken by the Member States and to exploit the results of research projects;
- to contribute to the implementation of other Community policies (environment, transport, etc).⁸

1.12 FP4 consists of 15 specific research programmes, support for the Joint Research Centre (JRC) (see below) and a number of other activities which are listed below. The initial budget for FP4 was 12,300 MECU; it was increased by 800 MECU on the accession of Austria, Finland and Sweden. There was provision for a further 700 MECU in 1996; in the event the Council of Ministers agreed to an increase of just 100 MECU in December 1996; this has still to be approved by the European Parliament. The current total budget for FP4 is therefore 13,200 MECU (£9,504m at the current rate). According to the OST, FP4 represents around 4 per cent of the total EU Budget; it is equivalent to about 3 per cent of the aggregate public and private sector R&D investment of individual Member States in 1993, or about 9 per cent of their total non-business R&D investment in 1993 (p 1).

1.13 The United Kingdom's notional contribution to FP4 for 1996-97 (notional, because Member States' contributions to the EU budget are not formally subdivided) is £391 million. This is approximately the same as the gross funding from the Government's Science Budget for the Engineering and Physical Sciences Research Council (EPSRC)⁹; it is about 6.5 per cent of total planned United Kingdom Government expenditure on science (£5973m), or 10.3 percent if defence research (£2188m) is excluded (pp 1 and 210).

⁷ POST 3.6.

⁸ *Research and Technology: FP4 (1994-98)* European Commission, 1995.

⁹ £386m: *Allocation of the Science Budget 1997-98*, Department of Trade and Industry, 15 January 1997.

Component Parts of FP4

ACTIVITY	ACRONYM	MECU¹	£m²
Telematics	TAP	898	647
Communication technologies	ACTS	671	483
Information technologies	IT	2057	1481
Industrial and material technologies	IMT	1818	1309
Measurements and testing	SMT	307	221
Environment and climate		907	653
Marine sciences and technologies	MAST III	243	175
Biotechnology	BIOTECH	588	423
Biomedicine and health	BIOMED	356	256
Agriculture and fisheries	FAIR	728	524
Non-nuclear energy	JOULE-THERMIE	1067	768
Transport		256	184
Targeted Socio-Economic Research	TSER	147	106
Co-operation with non-Member States and international organisations	INCO	575	414
Dissemination and optimisation of results	INNOVATION	352	253
Stimulation of the training and mobility of researchers	TMR	792	570
Nuclear fission safety (EURATOM)	NFS	441	318
Controlled thermonuclear fusion (EURATOM)	FUSION	895	644

¹ Values after accession of Austria, Finland and Sweden² At current rate

1.14 Although FP4 is only at its mid-way point, and much of the research that it is supporting has only begun very recently, planning for FP5 is already well under way. *Inventing Tomorrow*, published by the Commission in July 1996, was of the nature of a Green Paper on FP5. It proposed a slight change of direction, beyond "technical achievement" towards "meeting basic economic and social needs"; this would mean involving end-users in project design, putting more into demonstration, and giving more encouragement to exploitation. It set three "general parameters": time from research to market, which is getting shorter, blurring the boundaries between "basic" and "applied", "pre-competitive" and "near-market"; subsidiarity; and budgetary efficiency in the run-up to EMU. It laid down various "requirements" for EU research: to satisfy the expectations of the public; to improve employment and competitiveness; to push back the frontiers of knowledge through world-class science; and to improve the general climate for research and the partnerships between science, industry and the public.

1.15 According to *Inventing Tomorrow*, FP4 was "proving extremely attractive", with numerous projects and participants, and indeed as a consequence a high and rising failure rate for proposals. Member States and others commended the Framework Programmes not only for particular successful projects, but also for their contribution to networking and mobility of researchers. However, "Merely continuing FP4 would not be appropriate"; FP5 must be more focused, concentrating on topics which matched the concerns of Europe as a whole and the activities of the EU, while including some new themes.

1.16 For the actual content of FP5, *Inventing Tomorrow* proposed just three priority topics:

- life sciences and the environment;
- the "information society"; and
- sustainable growth in fields including products and services, energy, transport, agriculture and fisheries.

1.17 It also proposed three "horizontal activities" partly interwoven with the priority topics:

- "improving human potential", embracing training, mobility and networks of scientists, socio-economic research and foresight;
- encouragement of innovation, targeting smaller firms; and
- involvement of researchers from non-Member States.

1.18 *Inventing Tomorrow* committed the Commission to improved procedures for FP5: fewer programmes and committees, scope for adjustments as needs and opportunities change during the life of a programme, simpler internal processes and contract procedures, shorter deadlines for selection, contracting and payment, more transparent criteria for selection, continuous monitoring, and a means of dialogue with participants (possibly via the Internet). It also envisaged greater flexibility by means of generic technology programmes and task forces (see below). It concluded by inviting discussion. *Inventing Tomorrow* was presented to the Council of Research Ministers on 7th October 1996.

1.19 In November, the Commission issued a Working Paper, *Towards FP5: Additional material for the policy debate* ("Towards FP5": COM(96)595, ISBN 9278-11892-3). It proposed criteria for selection of programmes within each topic: need, opportunity, and above all "high European value added". Programmes proposed to be carried over from FP4 would be assessed for both outcomes and continuing justification. Co-ordination would be improved on three levels: within the Framework Programme; with other EU policies, especially the Structural Funds and the programmes of assistance for non-Member States; and with national programmes. Flexibility during the course of FP5 would be improved by continuing foresight, annual adjustment of programmes, and a small "free space" or contingency fund (see p 128). Oversubscription would be reduced by focusing the programmes, advertising their intended content more clearly, and pre-screening. On the crucial question of quantum, *Towards FP5* made no bid, beyond citing significantly the current rise in public sector R&D spending in Japan and the USA. *Towards FP5* was presented to the Council of Research Ministers on 5th December 1996.

1.20 In February, the Commission issued a further Working Paper, *Towards FP5: Scientific and Technological Objectives* ("Towards FP5 2"). The full text is printed in the volume of evidence accompanying this report (p 223).

1.21 Under each of the priority topics, or “thematic programmes”, proposed in *Inventing Tomorrow, Towards FP5* 2 proposes a set of “Key Actions”, as follows:

- (a) Unlocking the resources of the living world and the ecosystem
 - Health and food (including food safety and nutrition)
 - Control of viral and infectious diseases (including AIDS)
 - The “cell factory” (i.e. biotechnology)
 - Management and quality of water (both ground and surface)
 - Environment (including pollution, radiation, toxic substances and climate change) and health
 - New rural and coastal areas (i.e. agriculture and fisheries)
- (b) Creating a user-friendly information society
 - Services for the citizen (IT applications for education and training; health services; the old and the disabled; access to public services; environmental management; and transport management)
 - Electronic trade and new methods of work (including payment systems and security)
 - Multimedia contents (i.e. electronic publishing, language systems, information management)
 - Essential technologies and infrastructures
- (c) Promoting competitive and sustainable growth
 - Products, processes, organisation (for efficient and sustainable industry)
 - Sustainable mobility and intermodality (i.e. transport)
 - New perspectives in aeronautics
 - Marine technologies (ships; marine energy and minerals)
 - Advanced energy systems and services (including nuclear fusion)
 - The city of tomorrow (including urban transport, construction, conservation and social organisation)

1.22 To complement and support the Key Actions, each thematic programme is also to embrace “general activities for the development of generic technologies and basic research”. In “The living world”, the priorities for these general activities are to be ageing, degenerative diseases including cancer, genetic disorders; genome research and neuroscience; health systems, safety at work, drug abuse, bioethics; global change; and satellite observation. For “The information society”, the general activities will involve technologies for data creation, representation and manipulation; virtual reality; quantum, photonic and bioelectronic technologies for large-scale integration; high-performance computers, and super-intelligent networks. The general activities under “Competitive and sustainable growth” are to include new materials; standards, measurement and fraud prevention; and nuclear safety.

1.23 Each thematic programme is also to make more provision than in FP4 for support for research infrastructure: large facilities, networks and centres of excellence. For "The living world", these will include biological collections and clinical testing centres; for "The information society", advanced high-flow electronic networks; and for "Competitive and sustainable growth", computing centres and databases, wind tunnels and test laboratories.

1.24 *Towards FP5* 2 gives more detail of the proposed "horizontal activities":

- "Confirming the international role of European research": involvement of non-Member States in FP5 programmes; specific bilateral co-operation programmes; grants to bring in young researchers from outside the EU to work on FP5 projects; co-ordination with EUREKA (see Appendix 5) and other international bodies.
- "Innovation and participation of SMEs": dissemination, exploitation and technology transfer; financial engineering and venture capital; and extra help for smaller firms, particularly in less developed regions. See below, paragraphs 1.34 and 1.44.
- "Improving human potential": training and mobility (see below, paragraph 1.36), networks, conferences, prizes, public information, socio-economic research, and support for science policy makers.

1.25 The list of Key Actions and horizontal activities for FP5 suggests a high degree of continuity from the programmes and Task Forces of FP4; however *Towards FP5* 2 hints at certain differences of approach. FP5 will put more into demonstration, and "take more account, from the start, of user and consumer requirements in terms of safety and quality". There will be "closer linkages with initiatives and programmes carried out at Member State level". The "free space" (contingency fund) adumbrated in *Towards FP5* will exist within each programme, and will be kept free until the timespan of the programme is around three-fifths spent. The Commission is prepared to contemplate using Articles 130 k, l and n of the Treaty "to implement activities which have a particular interest only for a certain number of Member States"; the examples it gives are aeronautics and space. *Towards FP5* 2 preserves the silence as to FP5's budget.

1.26 The Commission's formal proposal for FP5 is to be published at the end of March, for preliminary consideration by the Council of Research Ministers on 15th May. Final agreement between the Council and the European Parliament is expected to be achieved some time next year. The Commission wishes to issue the first calls for project proposals in the autumn of 1998.

1.27 In 1993 the Committee was concerned about the time taken for the details of the Framework Programmes to be finalised and the subsequent lack of flexibility in the programme budgets. We were concerned also about the openness of the budget allocation procedures and the way in which programme themes were determined. For example, the apparent pressure for existing themes to continue from one Framework Programme to the next might disadvantage the adoption of new programmes when budgets are finite.¹⁰ We also recommended that greater emphasis be placed on support for mega-science topics (e.g. nuclear fusion) where the need for joint European action is clear, and that the Joint Research Centre should not continue to have a privileged 'inside track' to EU research funds.

1.28 We welcome the wide consultation process that is under way for FP5, but many of these concerns are still relevant today. At the forefront of current concerns are: the focus of FP5 and how its priorities are to be set; the balance between basic and applied research; co-ordination of activities within the Framework Programme; the role and funding of the JRC; the participation of smaller

¹⁰ The only new theme in FP4 compared with FP3 was targeted socio-economic research, although transport, which was only a minor topic in previous Programmes, has been greatly expanded.

firms; the participation of Member States with less advanced scientific capabilities; management of the Framework Programmes, including evaluation; and the fundamental questions of value for money and the benefits of participation. These are concerns that affect all Member States.

TASK FORCES

1.29 Under FP4 the Commission has addressed the problem of co-ordinating research efforts across Europe and reducing unnecessary duplication of effort by establishing a number of "Task Forces" within the Commission, aimed at strengthening the links between research and industry. They "are not the spending instrument as such. That remains ... the responsibility of the specific programmes" (Q 339). The Task Force themes are:

- Car of Tomorrow
- Educational Software and Multimedia
- New Generation Aircraft
- Transport Intermodality
- Environment (with a focus on water)
- Vaccines and Viral Diseases
- Trains and Rail Systems of the Future
- Maritime Systems of the Future

It will be noted that five of the eight Task Force themes concern transport.

1.30 The initial Task Force activities were to establish the state of the art in existing research and, with industry, users, researchers and public authorities, to identify which sectors merited additional research. Other options which might contribute to the effective application of EU research by industry, for example regulatory and fiscal considerations, were also to be investigated. The outcomes of these exercises, if not the methods, are somewhat similar to those of the Technology Foresight Exercise. In *EU RTD 1996* the European Commission said: "The Task Forces are an essential part of the Commission's strategy to improve the impact and reduce the fragmentation of research across the EU".

1.31 The Commission sought an additional 700 MECU for Task Force activities; the Council of Ministers (in December 1996) were prepared to give only 56 MECU, for New Generation Aircraft, Educational Software, Transport Intermodality and Environment. The British Government has raised objections and reservations about the proposal for additional funding and has also said that it would not support any major reallocation of funding in FP4 to reflect Task Force priorities.¹¹

1.32 The "Key Actions" proposed for FP5 are explicitly intended to carry forward the Task Force concept; indeed each specific Task Force mission is to be found somewhere in the list of Key Actions in *Towards FP5 2*.

DISSEMINATION

1.33 To gain the maximum benefit from the research process it is important for the results to be disseminated widely and for appropriate exploitation to be encouraged (p 127). In FP4, 352 MECU (£253m, 2.7 per cent of the budget) is allocated specifically to these tasks. Particular emphasis has been given to promoting industrial exploitation by smaller firms and in the less developed regions of the EU.

¹¹ UK Government's Response to the Commission's Green Paper on Innovation, DTI, 1 May 1996.

1.34 *Towards FP5* 2 indicates that the Commission intends to encourage exploitation from FP5 in a range of ways. Every thematic programme will have an Innovation Unit, an innovation support network, and a “structured interface” with the European Investment Fund and Investment Bank. Every project will include in its life-cycle actions to facilitate technology transfer, including finance and protection of IPR. The Commission will create “a service giving assistance in the area of IPR and access to private finance, notably the Venture Capital Funds”.

TRAINING AND MOBILITY OF RESEARCHERS

1.35 The expertise of individual researchers involved in Framework Programme projects is a resource in its own right and valuable for the process of technology transfer. FP4 caters for this through the Training and Mobility of Researchers (TMR) programme, accounting for a further 792 MECU (£570m, 6 per cent of the FP4 budget). TMR provides fellowships, research networks, access to large-scale national facilities, and funding for conferences and courses. Most TMR grants go to researchers from universities rather than from industry (Q 58).

1.36 *Towards FP5* 2 indicates that TMR will survive in FP5 under the banner of “Improving human potential”. Activities will include research training networks; personal grants, open to industrial as well as academic researchers; support for access to infrastructure, where this is not provided by one of the thematic programmes; and conferences and networks.

JOINT RESEARCH CENTRE

1.37 The Joint Research Centre (JRC) is the “corporate research laboratory” of the European Union. The JRC is supported by the Framework Programme, to provide impartial expertise to meet the needs of Community policies. The JRC developed from the need for expertise in the nuclear field in the 1960s and the bias today is still towards this area of research. It currently operates seven institutions at five localities in Europe.

1.38 The JRC was originally attached to DG XII, but, following a Commission decision in April 1996, it became an independent Directorate-General in its own right with Professor Jean-Pierre Contzen as the Director-General in charge. The work of the JRC is split into two main areas: research activities contributing to the Framework Programmes, and scientific and technical support activities related to other EU policies (e.g. energy, agriculture, the environment and industry). Most of the funding for the JRC is top-sliced from the budget of the Framework Programmes; FP4 will allocate nearly 960 MECU (£691m at current rate, 7.3 per cent of the post-accession FP4 budget) to the JRC during 1994–98. Funding from third parties, separate research for the Commission and other activities (including research on a commercial basis for public and private organisations) are expected to raise the JRC’s total budget to over 1200 MECU (£864m) over this period.

JRC funding 1994–98

	MECU
Information technologies	11.5
Industrial and materials technologies	96.0
Measurement and testing	112.5
Environment and climate	313.0
Agriculture and fisheries	50.0
Non-nuclear energy	21.0
Nuclear fission safety	270.5
Controlled thermonuclear fusion	49.0
Targeted socio-economic research	35.0
Co-operation with non-Member States and international organisations	7.0
TOTAL	958.5

1.39 The JRC operates a programmes directorate, a resources co-ordination unit and the following research institutions:

- Environmental Institute (EI), Ispra, Italy: Global change, manmade pollution (e.g. aerosols, groundwater pollution) and effects including impacts on health. Also support for agriculture policy, quality control of medicines and foodstuffs.
- Space Applications Institute (SAI) Ispra, Italy: Remote sensing applications (e.g. agriculture, fisheries, land-use management and environmental monitoring). Scientific support for agriculture statistics.
- Institute for Systems, Informatics and Safety (ISIS) Ispra, Italy: The science and technology of safety management (e.g. improving safety of civil engineering structures and nuclear reactors), the application of information technology, and methodologies for environmental management.
- Institute for Transuranium Elements (ITU), Karlsruhe, Germany: Raising safety standards of the nuclear fuel cycle (main focus on the safety of actinides), modelling of fuel properties, characterisation of spent fuel.
- Institute for Reference Materials and Measurement (IRMM), Geel, Belgium: Standardisation in analytical measurements, quality of standards and reference materials (isotopes and radioactive reference samples in particular). Main focus on nuclear safeguards and consumer products.
- Institute for Advanced Materials (IAM), Petten, Netherlands: Advanced materials e.g. for coatings, structural components, clean technologies and nuclear fusion. The IAM also operates a High Flux Reactor supplying radioisotopes to the pharmaceutical industry.
- Institute for Prospective Technological Studies (IPTS), Seville, Spain: Observation and follow-up of technological change. Technology Watch: to detect scientific breakthroughs and trends that might lead to innovation. Focus on relationship between technology, employment and competitiveness.

1.40 Ispra, Karlsruhe, Geel and Petten go back to the early days of EURATOM. Further information on each of these institutes can be found on the World Wide Web (www.jrc.org). Professor Contzen kindly supplied us with examples of the JRC's work (p 192); these include technical support for the European Agency for Evaluation of Medicinal Products, at Canary Wharf in London, provided by the Ispra Environmental Institute.

1.41 The Commission has been agonizing over the status of the JRC for some time. It has endeavoured since 1987 to operate the customer-contractor principle, and to reduce the dependency of the JRC on direct funding. In 1987, it was proposed that the JRC should be only 60 per cent direct-funded by 1991, and 50 per cent by 2000; but today the figure is still 74 per cent (*POST 3.7*). Each institute is now overseen by an independent Visiting Group. According to *Towards FP5 2*, "the institutional and operational role of the JRC in implementing FP5 would be at least on a par with its role in FP4".

SMALLER FIRMS

1.42 The participation of small and medium-sized enterprises (SMEs)¹² in the Framework Programmes is limited, and the Commission wish to improve it (p 130). Smaller firms face a number of problems: they may be unaware of the programmes and funding available; they may not have the links with other European firms and organisations needed to secure funding or conduct the research; and they may not have adequate resources to complete, or even contemplate, the application procedures which can take several months. Some initiatives have now been

¹² For these purposes, a SME is an independent company with no more than 500 staff and an annual turnover of no more than 38 MECU (£28 m).

implemented under the heading of Technology Stimulation Measures for SMEs and firms may now submit their proposals in two stages (an outline followed by a full proposal) with financial aid from the Community. Also, under Co-operative Research Action for Technology (CRAFT), smaller firms may entrust the execution of collaborative R&D work to one or more research organisations, while maintaining ownership of the results.

1.43 The Commission told us (p 130) that in 1995 1,782 smaller firms participated in the Framework Programme, and accounted for 15 per cent of EU research funding (20 per cent of participants, up from 17 per cent in 1994). However, "the current level of participation by SMEs in European research must be improved. A working party responsible for inter-programme coordination of implementation of the technology stimulation measures is working on this".

1.44 It appears from *Towards FP5 2* that the Commission intends to carry forward the Technology Stimulation Measures into FP5. It also intends to create a "one-stop shop" for dealings with the Framework Programme by smaller firms.

COHESION

1.45 One of the aims of the Framework Programmes since their inception (*POST 2.3*) has been to support European economic and social "cohesion"¹³. The Framework Programme aims to support less developed regions, for example by helping researchers and laboratories from these regions to join European research networks. Under the Training and Mobility of Researchers programme, for example, the following specific measures have been adopted to promote cohesion: an additional year's grant to help researchers from less developed or thinly populated regions to return to their region of origin; support for networking, in the form of funding for laboratory equipment; support for stays in these regions by experienced researchers; and "priority for young researchers from these regions for participation in Euroconferences". According to *Towards FP5 2*, FP5 will offer "Development grants intended to help develop a high-level research capacity in the less favoured regions of the Union".

1.46 According to *EU RTD 1996* (p 10 and Table 6) only 6 per cent of European Union researchers live in regions defined as underdeveloped. However in 1995 46 per cent of Framework projects had at least one participant from such a region; 14 per cent of Framework Programme participants came from such regions; and 17 per cent of the total amount spent on all projects was spent on projects involving at least one participant from such a region. According to the Commission's *First Cohesion Report* of November 1996 (p 71), "The participation of the cohesion countries in successive [Framework] programmes has gradually risen, even if slowly, and they have increasingly developed links with partners in the North of the Union". A Commission Communication on research and cohesion is expected shortly.

EVALUATION, ASSESSMENT AND MONITORING

1.47 The system for evaluating, assessing and monitoring specific programmes and the Framework Programme as a whole has recently been improved. DG XII A4 of the Commission is now dedicated to evaluation of FP4. Each specific programme is now evaluated in three ways: continuous and systematic monitoring of progress by external panels; external assessment of each programme and its management every five years; and external assessment on completion. The Framework Programme as a whole is monitored continuously, with annual reports; the first of these, by an international high-level panel serviced by a United Kingdom consultancy, came out in March 1996. The Programme is also to be externally assessed every five years; the first five-year assessment, by a panel chaired by Vicomte Davignon, is just completed. The criteria for assessment are scientific quality, quality of management, and achievement of objectives. These procedures are currently being rationalised, as part of the Commission's financial management initiative "SEM 2000". The Commission has also conducted multi-programme evaluations of Framework fellowships, of the impact of the Programmes on industry and on "cohesion", and of impact in

¹³ "In order to promote its overall harmonious development, the Community shall develop and pursue its actions leading to the strengthening of its economic and social cohesion. In particular, the Community shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least-favoured regions, including rural areas." Treaty of Rome as amended, Article 130a.

particular Member States, and “meta-evaluations”, or evaluations of the process of evaluation itself. More detail is given in *POST 5.2*.

THE COMMITTEE'S INQUIRY

1.48 This report was prepared by Sub-Committee I, whose members are listed in Appendix 1. They received evidence from the witnesses listed in Appendix 2; we are grateful to all the witnesses for their time and trouble. The call for evidence is set out in Appendix 3, a list of acronyms in Appendix 4, and a list of European research policy organisations in Appendix 5. The evidence is printed separately, in HL Paper 49—I.

CHAPTER 2 VIEWS OF WITNESSES

FOCUS OF THE FRAMEWORK PROGRAMME

2.1 There is a general consensus that the Framework Programme has been spread too thinly and too far between an ever-increasing assortment of programmes (e.g. QQ 133, 166, p 204). The Commission itself shares this view (see above, paragraphs 1.15–17), seeing selection of topics and concentration of resources as a top priority. It has cautioned, however, that there has in the past been an intractable barrier to the solution of this problem: “with each Framework Programme, the question arises of the “dispersion” of projects and resources. There is also the problem of incorporating novel ideas that arise during the course of the programme and the difficulty of winding up activities, each of which is of interest, *de facto*, to a particular group of people”.¹⁴

2.2 Professor Routti, Director-General of DG XII of the Commission, said that the Fourth Framework Programme was “probably too fragmented. It consists of up to 20 separate programmes and there are about 10,000 projects going on at this time. We cannot solve all the problems at the same time. We want to have a large number of participants in these programmes but we want to have more co-ordination” (Q 323). Professor Georghiou, Director of Policy Research in Engineering, Science and Technology (PREST) at the University of Manchester, echoed the Commission: “there seems to be a situation where once something is in place it cannot be cut back or removed from the Framework Programme” (QQ 66, 134). The Royal Academy of Engineering took this further: “one of the hardest things to do in research is to close down a project. This is what we have to do in some of the long-term areas of FP4 if we are to be able to open up new areas in Framework 5” (Q 191, cp p 198). The Biotechnology and Biological Sciences Research Council (BBSRC) pointed out, however, that the rise in allocation of funds to Biotechnology, from 2.8 to 4.4 per cent between FP3 and FP4, was clear evidence that the Framework Programme was responding to new scientific opportunities and was not just perpetuating past funding lines (p 116).

2.3 Professor Georghiou of PREST drew lessons from his chairmanship of the five-year review of the biotechnology programme. “We found in that review that it is large projects which have the most impact, for example, the well known case of the yeast genome, but there are others ... which are the largest projects in the programme and also have the most impact. That seems to indicate that where resources are concentrated more effect relatively can be achieved” (Q 69).

2.4 The Economic and Social Research Council (ESRC) criticised the often unscientific way in which the content of the Framework Programmes is arrived at. “You begin with ... national views about a future Framework Programme. There are typically long meetings of officials in Brussels which generate further proposals. All the major scientific bodies in Europe contribute their advice in such a way that you can observe a sort of ritual dance of deference ... around the Commission with visions of future research being expressed very eloquently. There is a certain degree of horse trading that goes on both inside and outside DG XII. Then, to add yet further complexities, there are direct interventions by Member States who want to ensure that their own interests are enshrined in any future programme” (Q 273). R&D proposals are subject to unanimity in the Council of Ministers; Mrs Eryl McNally MEP (p 199) remarked that majority voting would improve decision-making.

2.5 The Office of Science and Technology (OST) said that programmes had to be concentrated on the things which mattered most for Europe: “we want to constrain the programme and not allow too many baubles to be hung on it like a Christmas tree” (Q 22). “It is important to avoid the temptation to load the programme down with everybody’s pet subjects ... It is equally important that we work with other Member States to make clear that this does not necessarily mean fewer, bigger projects. Rather it means fewer, more important objectives. That is the message we have to work to get across, particularly to the smaller Member States ... Finally, subsidiarity is another key principle, which is important and separate from the added value principle. Article 3b of the Treaty requires that the Community does only the things which cannot be done by Member States. So even if the programme can add value at a European level there is still no case to intervene unless

¹⁴ *Inventing Tomorrow*, pp 10, 17.

to do so would be to achieve something which could not be achieved by Member States acting individually or collectively outside the Community" (Q 2).

2.6 The BBSRC spoke in favour of what they described as the European Science Foundation's *à la carte* process, whereby it was up to each country and each participating research council within those countries to decide whether they wanted to be involved in each new ESF programme. The EPSRC proposed that "only those Member States capable of undertaking research to the highest scientific standards are invited to participate in particular projects/programmes" (p 181); greater emphasis would then be placed on providing fair access to the resultant technology on a European-wide basis. The Treaty allows for such arrangements in the Framework Programmes (Articles 130k and l); the German government advocated such arrangements in their original submission to the Commission on FP5¹⁵; and the Commission appears to envisage an *à la carte* element to FP5: *Inventing Tomorrow* p 19, *Towards FP5* p 9.

2.7 Sir Dai Rees gave evidence in January, at the end of the inquiry, when the Commission's plans for FP5 were becoming clearer. He echoed others in criticising FP4 for lack of focus; the Commission had tried to be "omnivorous". The Framework Programmes accounted for only a small fraction of public sector EU research; so, rather than trying to cover everything, they should be looking for a niche. However he saw signs in recent Commission utterances that, for FP5, this lesson was on the way to being learnt (QQ 434, 436). He considers that a genuinely European research agenda can be identified; in the biosciences, it might include agriculture, environmental health and state health care systems (Q 436). Other witnesses generally agreed that, ultimately, the main determinants of what research should be funded were quality (e.g. pp 12, 40, 105, 148, 177, 213) and clear added value from organising the research at a European rather than national or global level (pp 90, 177, 179, 205, 212).

2.8 Professor Routti is clearly alive to the importance of subsidiarity. "It is important to define what we need to do together and what is best done at national level. If one looks at the history of European collaborative research, one can see that many areas are such that only common efforts are possible. The very expensive facilities needed for space research, particle physics, the European Southern Observatory and the like, have called for joint action, which has been typically organised in separate organisations. But also on the science side there are many issues which must be addressed, and can only be addressed, by common action. At the environmental side, global change, the greenhouse effect, the Mediterranean, the Baltic, the River Danube, the Rhine, are questions which cannot be addressed within the shores of a single country" (Q 323).

2.9 As noted above, *Inventing Tomorrow* commits FP5 to "meeting basic economic and social needs". Professor Routti explained (Q 323): "Commissioner Cresson ... has very much emphasised the needs of society, the concerns of the citizens, as the guiding principles for research programmes. These questions relate to employment, job security, physical safety, environment, education, welfare systems and so on". Mrs McNally MEP (p 198) offers another example of a "citizen-led" research agenda, focusing on health.

2.10 It is to be expected that a Framework Programme with socio-economic objectives will have an explicit element of funding for socio-economic research. Professor Routti acknowledged that TSER is a small element of FP4 (147 MECU, £106m, 1.1 per cent); "Its importance is growing, but I do not think we need to duplicate the effort done at a national level" (Q 341). It was however necessary to analyse as best one could the socio-economic impact of changing technologies (QQ 328, 341).

¹⁵ Overview of the external contributions to the preparation of FP5, Commission staff working paper SEC(96)2260, 29 November 1996.

VALUE FOR MONEY

Success stories

2.11 In 1992 a European project established the complete sequence of chromosome III of yeast. According to *POST* (5.4 (a)), "This is the first time that a chromosome ... has been sequenced; this has profound implications for the sequencing of higher animals (e.g. humans)". This was cited by many witnesses as a Framework Programme success story; it was achieved under the biotechnology action programme following collaborative work involving 147 scientists working in 35 laboratories in ten Member States. The Biotechnology and Biological Sciences Research Council (BBSRC) admitted that not all the genome work had "flowed from FP4" (cp QQ 409), but support from FP4 had "given an impetus to that work. The full sequencing of that yeast genome which is 6,000 genes is an extraordinarily important event".

2.12 We asked several of our witnesses to name the outstanding successes of Framework-funded research. The OST named the gene sequencing of yeast noted above, and of the plant *arabidopsis* (Q 5). Dr D A Parker, speaking for the Royal Academy of Engineering, singled out projects on information technology, ceramics, high-temperature superconductors, better use of fossil fuels and electric vehicles (Q 186). The BBSRC cited work at Oxford into aspects of carbohydrate recognition and control, which could lead to important developments for the treatment of diabetes; and genetic work to increase the health value of the tomato (Q 286). In the informatics field, the Commission pointed to ICL's "clear statement at the time that they publicised the Goldrush chip—the parallel-processing chip—that this was clearly and squarely based on a project which had been within the Information Technologies programme" (Q 356). The CVCP (p 158) supplied examples of projects involving United Kingdom universities where Framework funding has helped to strengthen European research (e.g. "Euroscren", on the ethics of genetic screening, at the University of Central Lancashire), or has led to better distribution of scientific skills (e.g. the Large Scale Facility for combustion in Cardiff, with grants to help scientists from central and eastern Europe to use it), or has encouraged industrial applications (e.g. Glasgow Caledonian University's project on an external intelligent lighting system), or has improved the quality of life (e.g. work at King's College London on molecular events influencing cellular behaviour in atherosclerosis, which has led to a patent and may produce drug- or gene-based treatments). For further success stories, see Box below. The Commission wishes to improve publicity for such stories (Q 356).

Benefits to Europe

2.13 Lord Kennet (who has contracts with the Commission to conduct conferences, research and publications on bioethics and national parliaments) cautioned that "clear value for money, or its absence, cannot in advance be demonstrated from any programme of scientific research, ... the higher the content of pure, as opposed to applied, research in a programme the more it is against our national interest to emphasise the question of value for money" (p 193). Nonetheless, the Parliamentary Office of Science and Technology (*POST*) made the attempt, and compared investment in the Framework Programmes with indicators of Europe's industrial competitiveness (production in high-tech industries, trade ratios, and ratios of R&D expenditure to production) and with indicators of European R&D activity (R&D spending as a percentage of GDP, scientific publications, US patents per MECU of R&D spending) (see *POST* 5.1). *POST* concluded, "There is no obvious association between the growth of the Framework Programmes and measures of EU competitiveness and technological success. Indeed, many indicators suggest a relative decline since the Programmes started. This is more likely to be a reflection of the inappropriateness of the measure than an overall reflection on the success/failure of the FPs, since the amount of money spent through this route is small relative to Member States' research budgets, or even the budgets of individual European companies".

2.14 *POST* also records the outcomes of various other evaluations of the overall impact of the Framework Programmes. A study carried out at Strasbourg University in 1994 attempted boldly—perhaps too boldly—to put numbers on the average economic benefit to participants in 50 projects in the BRITE/EURAM programme (advanced technologies and materials). It suggested an overall ratio of EU grant to direct economic benefit of 1:13, and a ratio of grant to indirect benefit of 1:4.

Further examples of success stories

Besides the yeast genome, *Inventing Tomorrow* (p 10) cites the following as "success stories": parallel computers, telecoms standards, and the first generation of electricity by nuclear fusion (by the Joint European Torus, at Culham in Oxfordshire, in 1991).

EU RTD 1996 (Part 2) sets out numerous achievements of FP3 and FP4 in 1995, including: the conclusion of RACE (advanced communications technologies, a major programme begun in 1988), leaving 70 per cent of participating companies in an improved competitive position, with 140 new patents registered and 48 pending; under ESPRIT (information technology), development of a miniaturised intelligent sensor for *in vivo* blood tests; under BRITE-EURAM (industrial and materials technologies), development by four small firms and a laboratory of a paper-based substrate to replace chlorine-based PVC in decorative applications for furniture, offering an economic gain over 1995–99 of 55 MECU for 2.5 MECU of R&D investment; under MAST (marine science), completion of the Mediterranean Targeted Project, which brought together 180 scientists from 70 organisations in 14 countries, producing 40 peer-reviewed articles, a handbook of methods and protocols, and large amounts of data on the Mediterranean ecosystem; and in biotechnology, 1,651 publications and six patents. The CHORUS technology has been adopted by CRAY research (USA) for the operating systems of its new supercomputer as well as carrying 38 software products for parallel processing systems for aeronautics and automotive industries; it is widely cited in the US as a reference model. New rare earth luminescent materials developed by a consortium of industrial and university partners for lighting have a prospect of a gain of 330 MECU over five years for an investment of 1.9 MECU. The European Gene Mapping Project, EUROGEM, is a network of 23 laboratories organising European work on the human genome; considerable success has been achieved, particularly on chromosomes 11 and 21.

In addition, *POST* (p 47) singles out the Boundary Scan Test, a new testing procedure for microprocessors developed under ESPRIT which has been widely adopted by industry and has led to a new company JTAG Technologies to exploit it; and the programme Make Gypsum Pay which uses biological and chemical processes to recycle gypsum waste.

2.15 According to the OST, "Evaluations that have been done of FP3, which are complete, and the monitoring and evaluation activities that are currently going on in FP4, suggest that there is clear added value. Real results are being achieved which would not come about if it was left merely to Member States to try to pull together the various parties across Europe to do this research further from the market" (Q 4).

Benefits to the United Kingdom

2.16 As noted above (paragraph 1.5), the Government believe that, in cash terms, the United Kingdom gets out of FP4 roughly what she puts in. "This, of course, ignores the broader financial benefits that derive from the exploitation of the research outputs and the non-financial benefits of participation. Though unmeasurable, these are likely to be considerable" (p 6). There was, in OST's view, "very hard evidence there that there is value for money in participating in the programmes" (Q 32). They pointed out that there was strong United Kingdom participation in the Framework programmes despite the fact that participants had to commit their own money to play a part in projects. "UK led projects are achieving consistently higher than average success rates overall—in some programmes they account for over 30 per cent of those selected—against very high levels of competition" (p 2). There was also a considerable amount of "repeat business", in that many of those who had participated in programmes came back for more next time round.

2.17 In 1993, the Government published the "UKIMPACT study": *The impact of EC Policies for RTD upon Science and Technology in the UK*. The work was done by PREST, mostly on the basis of a questionnaire to programme participants; the study was one of a series of similar national

impact studies organised by the Commission. The findings were broadly positive: the UK had more collaborative links through Framework projects than any other Member State; 93 per cent of academic participants, 76 per cent of industrial participants and 89 per cent of other participants intended to reapply. Most academic participants had benefited, or expected to benefit, through further funding and enhanced skills; most industrial participants expected in addition to benefit from new products and processes and new commercial links. See *POST 5.2.5*. The OST commented, "The 1993 UK impact study which was carried out by PREST showed a very positive impact on all sectors involved in the programme, which was then the third framework programme, FP3. It also demonstrated that the benefits were genuinely additional, either absolutely or in terms of the volume, speed or orientation of the relevant research. Taken together, we believe that these benefits fully justify the UK's continuing participation in the programme" (Q 3).

2.18 According to the NERC (p 205), United Kingdom environmental science has done well out of FP4. NERC itself won £6m of funding in 1995–96; and in two major programmes, Environment-and-Climate and MAST, United Kingdom researchers were involved in well over half the contracts. NERC acknowledges other benefits: "The [environmental science] community has also benefited from increased awareness of research undertaken throughout Europe and increased willingness to interact with scientists from overseas. The research contracts have benefited from the volume of research undertaken, providing in some cases gearing for domestic funding, and have accelerated and added richness to the science."

2.19 The ESRC said that "the funding of comparative and co-operative social science research within FP4 has been a genuine and unique incentive for work at the European level, which should be continued within FP5" (p 103). Research teams of individuals in Britain had "done very well" in the first call for Targeted Socio-Economic Research, in which 52 research teams in the United Kingdom had been funded.¹⁶ That was a substantially larger number than any other Member State, and significantly ahead of France with 34 teams funded, Italy and the Netherlands with 33 teams each, and Germany with 27. Furthermore, 13 out of the 38 major projects which had been funded were led by a principal investigator from the United Kingdom (Q 244).

2.20 The BBSRC said that "The return to the UK is consistently above *juste retour* [see footnote 1] with a high proportion of UK coordinators" (p 117). Sir Dai Rees is under the same impression (Q 453); he puts it down not only to scientific excellence, but also to "hunger". Sir Dai mentioned that the United Kingdom Research Councils and universities have opened a liaison office in Brussels. Many United Kingdom universities now receive a substantial proportion of their research grant and contract income from the EU: for example, Edinburgh 9 per cent (p 220), and Nottingham 20 per cent (Q 218). The Committee discovered the following further examples during an inquiry into *International Investment in UK Science* (4th Report, Session 1993–94, HL Paper 36, p 9): Oxford 4 per cent (1989–94), Cambridge 6 per cent (1992–93), Imperial College 9 per cent (1990–94), Loughborough 17 per cent (1992–93).

2.21 In relation to the academic community, PREST had carried out a study sponsored by the United States National Science Foundation, which found that before the Framework Programme United Kingdom scientists had tended to look to the USA for their prime collaborative links. "After the Framework Programme there was no drop in the level of links to the USA but a substantial increase in the number of European linkages. Indeed, UK scientists were sometimes used as a gateway to the USA". The fellowship schemes, in particular, had been highly effective in building up collaborative linkages (QQ 102–3). Overall, the United Kingdom was the most favoured partner for Framework Programme collaboration. She had the largest number of collaborative links within the Framework Programme, and was the favourite partner for most other countries, including France and Germany. Possible reasons for this included the quality of the United Kingdom science base, the English language, and possibly "the fact that our scientific community has been leaner and hungrier because of our domestic situation and therefore has been more motivated" (QQ 106–8).

2.22 It may no longer be true that United Kingdom researchers are the most favoured partners for Framework collaborations. According to *EU RTD 1996* (table 7), in 1995 Germany had the

¹⁶ The number of applications involving United Kingdom researchers was 99 (p 115).

most collaborative links (11,116); France had 10,542; the United Kingdom had 10,440; and Italy had 8,014. The United Kingdom was the favourite partner for researchers from Denmark, Greece, Ireland, the Netherlands, Finland and Sweden; but Germany was the favourite for France, Austria and Portugal (and the United Kingdom), and France was the favourite for Belgium, Germany, Spain and Italy.

2.23 Professor Jon McCleverty, of Bristol University and the Royal Society of Chemistry, spoke in favour of the Network programmes in the Training and Mobility of Researchers programme (TMR). They had "very substantially added to the quality of both European chemistry and British chemistry"; they provided good training; they favoured the United Kingdom through the English language; and, he added, "I have been able to establish collaborations ... with more colleagues in the best laboratories in Europe than would have been possible though United Kingdom resourcing alone" (p 217). However Professor Georgiou of PREST observed that at a scientific level globalisation has become significant. "If we confine collaboration to within Europe we are not always working with the world's best" (Q 86). The CBI said that access by non-Member States to the Framework Programme must be of "a truly reciprocal nature, so that we can participate fully, for instance, in the US programmes and they can participate in the Framework Programmes on equal footing" (Q 156).

2.24 The OST consider that their vision of a more focused FP5 can be achieved by "a programme at most of current size and possibly smaller" (p 3). Most witnesses were unwilling to contemplate the cessation of the Framework Programmes (e.g. QQ 187, 216, 404); despite all the complaints about inefficient management of the Framework Programmes (see below), they provided an alternative funding stream, which was clearly desirable.

Full economic cost

2.25 Framework grants, though generous as to salaries, are niggardly in respect of associated costs, paying only 10–20 per cent on top of salary. For comparison, United Kingdom research councils pay 40–45 per cent; medical research charities usually offer nothing. Professor Stephen Brown, Professor of Civil Engineering and Pro Vice-Chancellor at the University of Nottingham, estimated that Nottingham University was "subsidising through other funding streams our European Commission work to the tune of about £400,000 a year.¹⁷ That has to come from our higher education funding grant which does not compensate us to this extent or anywhere near it" (Q 218). When asked whether he ever dissuaded any of his university colleagues from applying for Framework funding on the grounds that the university could not afford it, however, Professor Brown replied simply: "No, never" (Q 223).

2.26 Professor Tom Husband, Vice-Chancellor of the University of Salford, speaking for the CVCP, told a similar story (QQ 365–378). "If we have a contract with the EU for £100,000 we get £15,000 back in overheads ... that in no way covers the full cost". He and the other CVCP witnesses explained that universities nonetheless continue to seek Framework funding for the less tangible benefits noted above, and because "many universities are driven to look for every revenue stream that is available". Professor Husband noted that the problem appeared to be unique to the United Kingdom; this was perhaps because in other countries universities received more core funding from central and local government.

BASIC RESEARCH

2.27 "Basic research" is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. This definition is taken from the "Frascati manual" of the OECD, which contains the set of definitions of categories of R&D in universal currency. The OST were opposed to basic research being funded by the Framework Programme, seeing this as the responsibility of national governments (QQ 15–16).

¹⁷ Nottingham University explained later: "Last year we received c.£6.3m in total EC R&D grants; average length is 3 years, implying an income of c.£2.1m per annum which attracts only 20 per cent overheads, say £420,000 per annum. However, this £2.1m comprises roughly 50 per cent salary element or say £1m which would, if we applied our normal full commercial overhead of 85 per cent, attract about £850,000 instead of the actual £420,000 detailed above. So about £430,000 (£850,000 less £420,000) can be said to be "subsidised" per annum".

2.28 The Commission, in *Inventing Tomorrow* (p 11), took a pragmatic view of this issue:

“Reduction in the period of time which elapses between “discovery” in the laboratory and putting products “on the market”, as well as the wider range of inputs required for the development of complex systems, tends to eliminate the old distinction between basic research and industrial and applied research. It is now difficult to catalogue the discovery of a new computer algorithm or a breakthrough in the sequencing of genomes, since the time between the discovery of new knowledge and its application may be extremely short. Consequently it is essential to maintain a research context which is open to new ideas, for work on basic questions which may possibly generate new fields of activity ... Discussions of the Framework Programme have always touched on the distance between research and the market and the difference between “academic” and “industrial” research. This is how the idea of “pre-competitive” research came about, although its boundaries have become rather vague and in practice it is largely ignored by the major competitors in Europe.”

2.29 The Royal Academy of Engineering was firm in its support for long-term pre-competitive research and development (QQ 194–195, 203). “FP4 has moved too far into the near-market area with the emphasis being on service and application solutions which are often far too close to the competitive arena. The lack of long-term R&D in programmes could jeopardise European industry’s long-term future by encouraging short-term exploitation without the balancing requirement of “seed-corn” research” (p 89). The Natural Environment Research Council and the Medical Research Council (pp 203, 206) consider that the time-span of the Framework Programmes is too short to allow long-term research to come to fruition. At a time when national research budgets in several Member States are under pressure in the struggle to meet the Maastricht convergence criteria, the collection of environmental data sets and lengthy clinical trials, in particular, may be targets for budget cuts, although this long-term research may be of great importance to the European citizen. Sir Dai Rees complained that the Framework Programmes offered nothing between short-term funding and the “immortality” of the JRC (see below) (Q 457).

2.30 Other witnesses in support of funding basic research through the Framework Programme included Loughborough University, the University of Edinburgh and the Royal Society (pp 194, 212, 219). The Royal Society called for at least ten per cent of each programme budget to be ring-fenced for underpinning basic research in the broad area of that programme; this funding should be separate from the Training and Mobility of Researchers (TMR) programme.

COHESION

2.31 In 1994, the Commission published *Evaluation of the Effects of the EC Framework Programme of RTD on economic and social cohesion in the Community*. It concluded that the Framework Programmes were making a significant positive impact on the research community of the less developed regions, and helped scientists in such regions by allowing them to participate in only the most advanced European research and development and forcing them to “raise their game”. See POST 5.2.2.

2.32 Sir William Stewart took the contrary view: “Cohesion has been used to justify mediocrity” (Q 411). The OST said in written evidence that “the Framework Programmes make a valuable contribution to the EU’s cohesion objectives” (p 8). On the other hand, during oral evidence the OST witnesses said that the cohesion objective was not best achieved through the R&D programme, and that quality should be the sole criterion on which research was funded. As they put it: “there is a risk in some senses of using cohesion as an excuse for supporting less than good research as a means of supporting the less favoured regions. We do not agree with that.” They considered, however, that the Framework Programme should remain open to the less developed regions (QQ 38–41, 43). However, the BBSRC said that there was no evidence from the Biotech programme in FP4 that scientific standards had been compromised in order to include participants from less developed regions (p 4)¹⁸; and the Commission insisted (p 128), “proposals [for fellowships] are selected for funding according to strict criteria of scientific excellence,

¹⁸ The BBSRC told us that, out of 206 Biotech projects funded so far, 71 included a Spanish partner, 13 a Portuguese partner, 15 a Greek partner and 22 an Irish partner. 106 had no participation from a “cohesion country”. 156 had United Kingdom participation.

although a proposal involving a less favoured region may be preferred above another without such involvement if the scientific quality is equivalent".

2.33 The OST thought that the Structural Funds were particularly suited to helping the less developed regions improve their scientific capability (Q 42). As the Commission explained (p 128), "The EU Treaty establishes a clear separation of roles between the Framework Programme and the Structural Funds regarding the actions related to Research and Technology Development. The RTD Framework Programme finances high quality trans-national research projects of community interest, while the Structural Funds finance RTD-related actions contributing to local, regional or national development". In 1994-99, 7,200 MECU, 5 per cent of the resources of the structural funds, will be devoted to research infrastructure, equipment and training in the less developed regions. This compares with the total budget for FP4, 1994-98, of 12,300 MECU.

2.34 The Royal Academy of Engineering thought that the cohesion objective should be tackled through a separate programme, possibly TMR (Q 233). Loughborough University and the Royal Society also emphasised the importance of technology transfer via individual people. Loughborough University suggested that successful research programmes should be followed up by technology transfer through a European-wide equivalent of the Teaching Company Scheme (p 195). The Royal Society said that "The simple inclusion of partners from less scientifically advanced countries is not the most effective way to improve standards across the EU". They proposed that an element of funding be attached to each Framework grant to support training fellowships. These fellowships should only be open to individuals of Member States not already represented in the grant-holding consortium and should also include a period of funding to facilitate technology transfer when the fellow returned home (p 214, cp QQ 411, 422-5).

2.35 Sir Dai Rees agreed (Q 436) that building research capacity and encouraging individual scientists in less developed regions was a right objective; but doing it through projects in the Framework Programmes encouraged the less developed countries (notably Ireland, Portugal and Greece) to rely on handouts rather than make their own research agenda, and patronised researchers who wanted to win funding on the basis of merit rather than geography. The Commission's *First Cohesion Report* (p 72) acknowledges the danger that research funds directed to less developed countries will be monopolised by the local centres of academic excellence, with the results that "the research agenda loses its relevance to the development needs of the poorer countries" and the divide between academic and applied research in the region may be exaggerated. The University of Edinburgh argued that cohesion would be served better through continued support for large-scale facilities which might not be available in some Member States, and by improving the availability of research results to less developed regions (p 221). Tim Gatland, a member of the UK Foresight panel on information technology, said (p 185): "I believe that the Framework Programme must be totally driven to achieve excellence in its chosen areas of research. This means that the project partners must be selected on purely meritocratic grounds. The cohesion objectives should be achieved using technology transfer mechanisms and these must be treated as a separate activity from the main projects".

SMALLER FIRMS

2.36 Professor Georghiou of PREST said that a number of evaluations had suggested that only a small minority of high-technology small firms performed the type of research covered by the Framework Programme. It should therefore come as no surprise to learn that only a fairly small proportion even of technology-based smaller firms benefit from Framework. Most such firms could not afford either the overheads or the long time scales for exploitation which most Framework Programme activities offered. "However, rather than give them alternative instruments of support, great effort goes into trying to help them apply to and participate in the Framework Programme. Our point was that these firms would benefit more from assistance with project development or acquisition of technology from outside the firm—licensing and so on". He added, "there are both costs and benefits to collaboration, but the costs tend to be up front (the costs of making applications, of holding up your work while you wait for an unpredictable period to get a response from the Commission and so on) whereas the benefits come some way downstream when the results are exploited" (QQ 69-70, 73). The most recent evaluation had shown a clear difference in the demands made by large companies and smaller ones. "Large firms in the biotechnology sector supported the kind of longer-term research which was going on in the programme and were well

equipped to make good use of the science base. The pressure from SMEs was for much nearer-market work which would result in a clear product at the end of the project, a type of project which is outside the remit of the present Framework Programme" (Q 73). The Biotechnology and Biological Sciences Research Council thought that few smaller firms were involved in the EU biotechnology programme, although more of those involved were from the United Kingdom than from any other country (Q 303).

2.37 The CBI commented on the existence of "multiple points of contact for the European Framework Programme, the innovation relay centres, the business innovation centres, the Euro-info centres, which are primarily associated with libraries." They called on the Department of Trade and Industry to take a lead in focusing these contacts, particularly in dealing with the needs of smaller firms. The CBI thought that in the United Kingdom the Business Links Programme was "an ideal vehicle to have this responsibility" (QQ 145, 148–151).

2.38 The Royal Academy of Engineering (RAEng) thought that the participation of smaller firms in the Framework Programmes had not been "terribly successful". The degree of bureaucracy and the low success rates for applications were cited as major deterrents. "The amount of work you have to put in in order to link up with the other European companies and universities is so large that if you do not succeed within the first two or three attempts you are inclined to give up" (QQ 204–205, p 90). The RAEng cautioned, however, that the term "SME" covered a wide range of businesses. A company such as Oxford Instruments, which was a world leader in a small area, was already close to the main science stream "and no doubt much more capable of collaborating in Framework Programmes" than a company with a more mundane business (Q 206). The RAEng favoured supporting smaller firms through finding appropriate mechanisms for the dissemination of research results (p 8). The OST, however, said that they were encouraged by the level of participation from smaller United Kingdom firms and that a broadly similar level of special provision should be maintained in FP5 (p 8).

TASK FORCES

2.39 The majority of witnesses agreed that Task Forces had a valuable role to play in the co-ordination of research efforts across programme areas, between Directorates-General and between Community and national programmes, and that they, or some similar mechanism, should be maintained in FP5 (pp 105, 117, 184, 220, 222). We ourselves looked into the role of the Task Force on the Car of Tomorrow in the context of our recent inquiry entitled *Towards Zero Emissions for Road Transport*, and were favourably impressed (1st Report, Session 1996–97, HL Paper 13, p 47). However, some witnesses criticised the "arbitrary" way in which the Task Force topics emerged without consultation with Member States and the "bizarrely unbalanced" or "skewed" set of priorities which resulted (pp 5, 40, 65, 204).

2.40 Professor Georghiou of PREST said that "there should be a more systematic process for identifying areas to be explored in this way" (Q 83). The CBI expressed a similar view: "the Task Forces ... were a laudable attempt, and they are a laudable attempt, to build the perspectives of the different players, academia, industry and anyone else with a pertinent comment to make, and we would like to see that continue and to be strengthened ... in its coverage of the key players and ... its coverage of the scientific areas that are of importance to Europe, rather than a somewhat bizarre collection as seems to be true of the first choices." The CBI proposed that the Task Force should become "the senior research board", charged both with consulting widely, with appropriate membership to reflect this responsibility, and with overseeing the running of the programmes (Q 164).

2.41 Professor Routti accepted that there had been criticism of the initial choice of Task Force topics, and saw the Task Forces—whose name might be changed—as "a management and co-ordinating tool". In future the Commission would not choose Task Force subjects without consultation, and it had only done so initially because "the time available for making those proposals regarding task forces was very limited. There was not a chance to invite proposals for this new concept and its priorities and to analyse these in detail. The task forces were launched as a pilot phase and we actually now see that the funds will not be available in the quantities originally planned for" (QQ 326–327, 334, 337–339).

2.42 Another role proposed for the Task Forces should be to watch technological developments and establish research priorities (pp 53, 89, 220, 222): for example, identifying important topics that might slip between two programme areas, or research that would be better done on a European level. The University of Edinburgh suggested that the Task Forces should follow this through by helping to evaluate proposals in these priority areas and then monitoring the selected projects as they are undertaken (p 220). The Commission also said that the existing co-ordination activities of the Task Forces were very important and examples were cited of how links between research groups and industry had persisted beyond the original Framework Programme collaborations (Q 339).

2.43 Most witnesses agreed that the Task Forces should not have their own research budgets to control, nor should they be involved directly in the allocating of funds, and that instead they should operate from within the specific programmes (e.g. pp 91, 118, 181). The opposing view was expressed by Loughborough University which said that the existing Task Forces should be expanded and that "There is little point to having a Task Force without its own budget" (p 195).

2.44 The Committee of Vice-Chancellors and Principals, SmithKline Beecham and the OST questioned whether the Task Forces were needed at all (pp 5, 65, 146). The OST suggested that a total reorganisation of the management of the Framework Programmes was required in which only certain aspects of the existing Task Forces would be preserved in Advisory Groups. These Advisory Groups would work closely with the scientific community to identify research and development needed to achieve stated thematic objectives, they would oversee the programmes, and they would act as a proxy customer for the research outcomes (p 5, cp ESRC Q 262). The European Commission told us that the Task Forces had a future as a "management tool" for identifying the problem areas where research was needed, and what research teams would be needed to provide the answers (Q 337).

ADMINISTRATION

Cost

2.45 The administrative costs of the Framework Programmes are high, with an average of 8 per cent¹⁹ of programme budgets set aside for administration. The OST said that "though the Commission themselves claim that their costs compare well with those of similar organisations in Member States, comparable costs for UK Research Councils are well under 5 per cent and are subject even then to continual downward pressure" (pp 8–9). Far from guaranteeing effective management, these high costs have failed to prevent a constant stream of criticisms about the administration of the programmes.

2.46 The European Court of Auditors reported in November 1996²⁰ that eight research projects revealed, on random audit, irregularities amounting to 28 per cent of their total cost to the EU (1.7 MECU out of 6.3 MECU). The Commission has responded by trebling the internal financial audit staff of DG XII from 4 to 12. The Court of Auditors has now begun a major "systems audit" of the whole of EU research activity.

Failure rate

2.47 Most witnesses drew attention to the waste of time and effort expended by unsuccessful applicants for Framework funding (QQ 22, 174, 178, 204–206, 212, 215, 245, 309, 313). *Inventing Tomorrow* (p 10) said that there was a "continual increase in the number of proposals not accepted: on average only 1 in 6 has received funding"; in written evidence to us, the Commission gave the figure of 1 in 5 (p 126); according to the 1995 Monitoring Panel, "most of the programmes had success rates in the range 20–30 per cent" (i.e. 1 in 5—1 in 3). *Inventing Tomorrow* concluded that "these preliminary figures clearly indicate a need for better targeting of calls for proposals and for more concentrated efforts as a way of reducing the dispersal of resources and the administrative burden. A detailed evaluation of projects will accompany the formal proposal for FPs". For

¹⁹ The range is 5–14 per cent according to OST (p 8), or 5–12 per cent according to the 1995 Monitoring Panel, who commented on the "lack of available data".

²⁰ OJ C340, 12 November 1996, p 214.

comparison, the success rate of new project grant applications to the United Kingdom Medical Research Council for 1996–97 was just under 1 in 5; the BBSRC success rate is similar (Q 311).

2.48 The CBI was one of a number of witnesses to comment that the success rate was “very much worse” than 1 in 6 in certain areas (Q 174). According to the Royal Academy of Engineering (RAEng), in the Developing Countries Programme, the success rate was as low as 1 in 12 (p 88). The ESRC said that 548 proposals had been submitted for the Targeted Socio-Economic Research Programme, out of which 38 projects had been awarded, a success rate of only 1 in 14 which they attributed in part to the insufficient targeting of the call for funding applications (Q 245). Another particularly over-subscribed area is life sciences, where the success rate is 1 in 15 (Q 344). In 1995 the TMR programme saw considerable oversubscription; the acceptance rates were below 1 in 10 for PhD grants, and under 1 in 15 for funding of research networks. Professor McCleverty (p 217) blamed this on the high level of awards, about 1.3 MECU per network.

2.49 The BBSRC spoke of the discouragement encountered by the large numbers of unsuccessful applicants (Q 313). Professor Routti of the Commission thought that response times for processing applications were important in relation to the impact of failure—“in this field sometimes we say that there is nothing worse than “slow - no” ” (Q 343).

2.50 Professor Tom Husband of Salford University put a more positive light on the Framework Programme failure rate (Q 366). “Actually, 1 in 6 is not too bad compared to some of the research council programmes in Great Britain. Also in most cases the costs which are associated with an individual university making a bid to Europe tend to be marginal costs for a very good reason in that very commonly the bid that is being made by an academic plus his industrial collaborators is lifted in part from other bids for other funding sources, from industry perhaps in the past or a recycled bid from a previous project or from a rejected research council bid or whatever. It is very unusual actually to start *ab initio* and say, “I shall write a bid for a particular project”.” Professor Amman of the ESRC made the same point (Q 255).

2.51 The 1995 Monitoring Panel found that, as a consequence of oversubscription, the Commission often puts successful bidders under pressure either to reduce their budget or to merge with other groups. They deprecated both approaches; they recommended instead budgetary reallocations from under-subscribed programmes to oversubscribed programmes.

Selection process

2.52 DG XII submits all Framework project proposals to peer review, i.e. assessment by independent experts in the relevant field, but not in the same way as (for example) the United Kingdom Research Councils. In the United Kingdom, a Research Council committee receives proposals, sends them out to appropriate experts for comment on quality, receives their observations and decides against its own priorities which alpha-rated proposals will receive funding. The Commission described their procedure for us (p 129): proposals are submitted to an evaluation panel of independent experts, who award each a numerical mark. The Commission then selects proposals for funding, taking into account not only the mark, but also the objectives of the programme and the size of the budget. The Commission’s selection is submitted for approval to a programme management committee of representatives of the Member States.

2.53 The University of Edinburgh approved of the Commission’s reliance on external evaluators to assess proposals, but thought that “the timescales they are given to do their evaluations are very short and can lead to insufficient review of certain proposals. This is ultimately a waste of time and resources” (p 221). Professor McCleverty, who has served as an evaluator for FP3 and FP4 in the TMR field, is content with the process and the timescale, but considers that the large number of applications and the absence of focus reduce selection to the level of a “lottery draw” (p 218). Sir Dai Rees considers the system a highly inefficient use of money (Q 434); and Sir William Stewart told us, “I see researchers winning grants in the Framework Programme who would not stand a chance in the peer review system in the UK” (Q 405). Sir Dai suggested that the Commission might do here what it does in other areas, and delegate the peer review function to national bodies with the necessary expertise; but he acknowledged that this would run counter to the prevailing culture of central management of research (Q 446).

2.54 The OST believed that all Member States shared the United Kingdom's concern about the "excessive length" of the initial selection process and the lack of transparency in a number of aspects (Q 25, p 9). The Commission had proposed setting itself targets "that will be excellent (if they meet them) for increasing the speed of flow-through of project applications which is a source of great frustration to applicants at the moment". A number of improvements were in train to make the peer review process more transparent. The Government were seeking better feedback both to the applicants and to the management committees, and to improve the contract negotiation process following the initial selection "both to make it quicker and to try to avoid some of the ... unnecessary chopping and changing of projects at that stage, which again is a source of aggravation and inefficiency" (Q 25). One recent innovation which was now available to applicants for Framework funding was "a kind of self-help manual in which you can check your own proposal against the evaluation criteria" (Q 30). We learn from the report of the 1995 Monitoring Panel that some programmes are experimenting with electronic "on-line" application systems and pre-screening of applications; the Panel were not convinced that either would improve the situation. The OST would welcome, as a step towards greater transparency, identification of the members of peer review panels (Q 31). The Royal Society went further and called for independent observers to be present at panel meetings, saying that "Secrecy does not engender confidence within the scientific community and is not required to protect panel members from lobbyists" (p 213).

2.55 The 1995 Monitoring Panel's report echoes the general dissatisfaction with the selection process. With nearly 5,000 experts involved, the process is very complicated to organise. Evaluators are recruited at short notice, sometimes as little as four weeks. "Industry is generally poorly represented in the evaluation panels, even in the industry-oriented programmes." The evaluators' reports are of variable quality and consistency. The final selection by the Commission is "the least transparent part of the application process".

2.56 Professor Routti agreed that the Commission needed to process proposals more quickly. He thought that the minimum length of time needed to satisfy rules of impartiality and transparency was three to four months (Q 335).

Issuing of contracts

2.57 The long time between a funding decision being taken and the issuing of a contract was a cause of particular complaint (QQ 309, 449). The Royal Academy of Engineering (RAEng) identified some specific problems. Firstly, although the process of receiving approval for Framework funding was a lengthy one—"anything from nine to 12 months or even longer" (Q 214)—the Commission often gave successful applicants only very short notice of the start dates for projects. "The rule of the game is that the contract will start on the first day of the month after signing the contract. Contracts are only signed by very senior people in Brussels and if they happen to be out of the country and turn up on the 30th of the month they sign it then and you are expected to start a day after or two days after." This caused problems for universities in particular, as it was usually necessary to recruit research assistants to work on the projects "and you cannot do that at a moment's notice". Second, it was "extremely difficult to get an extension to a contract to compensate maybe for a late start consequent upon you wishing to recruit staff" (Q 213). The RAEng called for a notice period of about three months between definite approval of a project and its start date, with "some degree of flexibility" (Q 214). The Commission told us (p 127) that this was already the case: "Many contracts are subject to specific agreed start dates, up to a year beyond the time of contract negotiation".

Internal communication

2.58 The following DGs have a significant role in managing FP4:

- DG III (Industry): information technology programme (ESPRIT);
- DG XII (Science, R&D): overall responsibility;
- DG XIII (Telecommunications, Information Market and Exploitation of Research): advanced telecommunications (ACTS) and telematics programmes (in Brussels; this remit predates FP1) and dissemination and exploitation of research (in Luxembourg; under the same Commissioner as DG XII);
- JRC.

2.59 In addition, specific programmes are administered by DG VI (Agriculture), DG VII (Transport), DG XIV (Fisheries) and DG XVII (Energy). DG III and DG XII were under the same Commissioner until 1973, and from 1981 to 1989; but they are currently under different Commissioners.

2.60 The Commission assured us (p 129) that "Generally speaking, co-operation and co-ordination between DGs works well". According to the 1995 Monitoring Panel, "Useful experience has been gained through the joint management of some programmes by different DGs". However, poor communication between different Directorates-General of the Commission was viewed by several witnesses as a serious impediment to the efficient management of the Framework Programmes (QQ 84, 167; p 4). Sir William Stewart commended the United Kingdom structure, with a single Government Chief Scientific Adviser and an Office of Science and Technology with cross-departmental responsibilities (Q 419).

2.61 The ESRC mentioned a further example of poor internal communication within the Commission, based on evidence from the Management Committee of the Targeted Socio-Economic Research (TSER) Programme. "We have a lot of evidence from within that programme Committee that DG XII, which runs the TSER programme, has rather weak links with, for example, the Directorates-General responsible for the economic and social policy, so the content of the TSER programme that relates to social exclusion, for example, seems to have been driven forward without a great deal of consultation and interaction between DG XII and DGV." They added, "there are lots of other examples one could give of a similar kind" (Q 252).

2.62 Delays created by an apparent reluctance or inability to delegate mundane administrative tasks within the Commission were another source of complaint from witnesses (QQ 138, 213). The lack of delegation in Commission procedures for financial approvals was of particular concern (Q 417, p 9). Professor Georghiou said that "it is very difficult [for Commission staff] to delegate any powers at all. All commitments even of the smallest kind have got to be personally authorised by Directors-General and letters have to be countersigned by people one or two grades up the system" (Q 95).

Staff

2.63 *EU RTD 1996* (p 13) sets out the current position concerning staff responsible for managing the Framework Programmes: "99 new posts were created in 1995, bringing the research management staff up to 1453 authorized posts by 1 January 1996". Of these, 1100 are in DG XII (p 130). Several witnesses praised the high quality and degree of commitment of the Commission staff involved in administering the Framework Programmes (eg pp 66, 177, 182, 206). The OST pointed out that "at any one time they administer several thousand project contracts, far more than any other EU activity" (p 8).

2.64 A number of witnesses, including the ESRC, expressed concern about the lack of continuity in Commission staffing (Q 260). The OST observed that "all bureaucracies suffer from too rapid turnover of staff in key positions" (Q 29). Professor Routti thought that the Commission had an adequate number of staff, and that staff turnover was not a major problem. "Of course we want to maintain a certain degree of staff renewal because it is important that you keep up with the latest developments of science and technology. Maybe the more difficult thing on the staff side is the contractual expertise, lawyers, auditors and so on, which is more and more demanding" (Q 342).

2.65 The ESRC pointed to problems with the TSER programme and attributed them to the Commission having neither sufficient staff nor staff with the right expertise to ensure that the programme objectives could be met (pp 103, 106). The Royal Society said that the Commission should consider contracting out management of some programmes where it did not have the necessary internal scientific expertise (p 213), but the CVCP warned that parochial attitudes could develop with such fragmentation of responsibility (p 148).

2.66 The BBSRC favoured an internal approach. It complained that "Scientific staff are used to perform routine administrative and clerical tasks and there is insufficient knowledge of the corresponding structures and procedures in Member States. This suggests that DG XII would

benefit from a more appropriate balance (within existing administrative costs) between scientific and support staff and more staff with a background in science administration" (p 118).

Root and branch reform

2.67 The Commission told us (p 126) that substantial reforms of their procedures are already in hand. Better information is to be given about conditions of eligibility and criteria for evaluation; pre-checking of project outlines is to be extended; evaluation manuals are to be published; independent high-level observers will monitor evaluations; the system of nomination of experts is to be made more transparent; the time from close of call for proposals to evaluation decisions is to be reduced from 4–5 months to 4 months; applicants are to receive early notice of whether they have scored high enough on evaluation to be short-listed for funding; and the time from evaluation decision to contract is to be cut from up to 4 months to 2 months "in normal circumstances". *Towards FP5* 2 suggests further possible reforms: for instance, whereas at present calls for project proposals are issued periodically, with fairly short deadlines for response, some calls might be left open permanently.

2.68 Sir William Stewart (QQ 405, 417) considers that the whole approach of management from the centre, which pervades the Framework Programme, is outdated. Sir Dai Rees drew to our attention the AMICA Science European Economic Interest Grouping, a consortium between the Max Planck Institute for Plant Breeding in Cologne and the John Innes Centre in Norwich, formed by the Commission in 1993 to co-ordinate the "Plant Molecular Genetics for an Environmentally Compatible Agriculture" project. This was, in his opinion, a successful experiment in delegated management, which deserved to be repeated (Q 439).

2.69 Professor Georghiou of PREST thought that root and branch reform of the Commission's existing procedures, including the setting of performance targets, was called for. "It is probably time for some business process engineering within the Commission and it is time to think what we really want them to do, and if we want them to be able to produce a contract within a month, it is up to them to design a process which is capable of doing that" (QQ 128–131). SmithKline Beecham also recommended that the Commission should "establish a roving working group dedicated to the review and simplification of every Framework Programme procedure" (p 66). Greater use of electronic information systems (e.g. the World Wide Web) and standardisation of documentation were called for by other witnesses (pp 144, 219). However Sir Dai Rees made the rueful observation (Q 453) that simpler procedures only encourage more applications, pushing the failure rate even higher.

VAT

2.70 The University of Edinburgh (p 222) and the Committee of Vice-Chancellors and Principals (CVCP) (p 149) complained that United Kingdom universities were having difficulty reclaiming VAT incurred on contracts for research funded under FP4, because the Commission and the United Kingdom Customs and Excise were not agreed as to whether these contracts are within the scope of VAT or not. As a result, the universities were having to carry this cost themselves.

2.71 The OST said in November that since the Committee brought this issue to their attention steps had been taken to address it. "Our colleagues at Customs and Excise, who have responsibility for the problem, have already started to negotiate a way forward with the relevant Directorates-General in the Commission, which will mean that universities should not be burdened in future with a need to reclaim VAT from the Commission. By dint of a sensible arrangement between the Commission and Customs and Excise, this problem should disappear very shortly" (Q 60). Ten weeks later, however, the OST were less optimistic (p 211): discussion between Customs and the Commission was continuing, with no prospect of early settlement.

ATTRIBUTION

2.72 United Kingdom Government Departments which have interests matching those of EU programmes have their budget baseline reduced by the Treasury in proportion to their interest in the United Kingdom's notional contribution to the relevant part of the EU budget. This process is known as "attribution". Other Member States operate the contrasting principle of "additionality", whereby their EU budget contribution is top-sliced and not attributed to Departments.

2.73 The OST explain, "Attribution is a budgetary discipline, not a mechanical process" (pp 1-2). More money available from Brussels need not mean less money from Whitehall; the Minister concerned may argue for attribution to be offset by additional resources for his departmental budget, or may reallocate resources within his budget to determine where the impact of attribution is actually felt.

2.74 The Commission said, "The way in which each Member State approaches questions on national funding are, essentially, matters for that Member State" (p 127). However, they insisted, "In accordance with Article 130g of the Treaty, the funding which is allocated to Community RTD is for activities which *complement* those carried out by the Member States. By that token, a Community research activity should not lead automatically to a matching cut in activities in Member States".

2.75 In evidence to this Committee on the Fourth Framework Programme in 1993, Commissioner Ruberti suggested that the United Kingdom's attribution policy resulted in "negotiation problems": "when defining the overall budget for research in the context of the European budget, the United Kingdom is always very cautious because it must decide which part it has to take away from its national organisations ... This is why the United Kingdom, in the discussions, has difficulties in determining the resources to allocate to research" (Q 10 of 1993 evidence, printed with 1st Report, Session 1993-94, HL Paper 5, ISBN 010-400594-7).

2.76 We invited the Treasury to comment. The Treasury's response did not touch on Professor Ruberti's allegation that the United Kingdom's attribution policy caused difficulties in negotiations. The Treasury also declined to agree that other Member States regard expenditure from the Community Budget on research as purely additional to such expenditure in national Budgets. It did, however, concede that "so far as the Treasury knows no other Member State routinely uses mechanisms for this purpose which are quite as formalised as those of the UK" (p 219). For Sir William Stewart (Q 413), being out of step is itself a strong argument against attribution, whose purpose he sees as "to cream off funds from the budgets of departments which support science for use in support of European policy".

2.77 The OST said that it had "no reason to believe that the system has influenced the UK scientific community's priorities inappropriately" (p 207). Representatives of the Research Councils suggested otherwise. The ESRC said that "attribution may have the unintended consequence of reducing the quantity and quality of UK inputs to debates on the Framework Programme" (p 106). They questioned whether Government Departments "facing the possibility of attribution would be inclined to be enthusiastic about research which had a very powerful cross-departmental character" (Q 285).²¹ The BBSRC made a similar point: "an incidental consequence of the attribution policy of HMG is to reduce the quantity and quality of inputs to discussion on the Framework Programme in its key, early stages, as departments fear the financial consequence of suggesting new ideas" (p 118). Sir William Stewart suggested, as a reason for supporting the paucity of truly basic research in the Framework Programme, that more money for basic research at the EU level would, by attribution, mean less money for the Research Councils in the United Kingdom (Q 405).²²

JOINT RESEARCH CENTRE

2.78 Professor Contzen, Director-General of the JRC, set out for us (p 191) his criteria for assigning work to the JRC: European added value, the highest quality and integrity, and the clearly expressed needs of an identified customer. Professor Contzen considers that the JRC has three categories of customer: the EU itself, through the ring-fenced portion of the Framework programme; Commission DGs, for work in support of other policies; and other customers for R&D who select the JRC on a competitive basis. The concerns of our other witnesses focused on that part of the JRC's function which is sponsored by "the EU itself": we detected a widespread view that, in this area, there is no check on the criteria of European added value, quality and customer need.

²¹ See also POST, Box 6.1.

²² In 1994 and 1995, the United Kingdom Framework contribution was attributed 13.5 per cent to the OST/Science Budget/Research Councils, and 60 per cent to the rest of the DTI: *Technology Foresight*, House of Commons Science and Technology Committee, 1st Report, Session 1995-96, HC 49, p xxvii.

2.79 Curiously, in the light of the British Government's enthusiasm for Prior Options reviews of public sector research establishments, and for their privatisation, the OST did not admit to questioning the Commission's need for an in-house research capacity, and merely pressed for "agency status" for the JRC (QQ 50–55). The BBSRC took a different view, saying that it would be better if this research were commissioned "more independently" on an *ad hoc* basis (Q 321). Sir William Stewart went further (Q 421): large in-house research institutes are outmoded, and insufficiently "nimble" for the current pace of change; there was a case for a European facility for nuclear fusion research, but the work of the Environmental Institute, the Institute for Reference Materials and Measurements, the Institute for Advanced Materials and the Institute for Prospective Technological Studies would be done better in national institutes or in universities.

2.80 PREST considered that "the earmarked funding for the Joint Research Centre should be reduced to the level needed for the basic infrastructure of an international laboratory, accepting that such a thing would have perhaps a higher cost base than a purely national institution, but after that to make it compete for most of its project funding and certainly for all of the funding that it gets from the Framework Programme" (Q 112). Similarly, the BBSRC, which advocated exposing the JRC to competition, said that there could be a case for an element of core funding to ensure continuity. "Without that continuity there can be mission drift ... meaning that they can be distorted from the central feature and the importance of the work by having to earn money in some areas. So there is a very fine balance" (Q 318).

2.81 The CBI criticised the ring-fencing of the JRC's Budget: "the principle of saying you will ring-fence this area, irrespective of quality, whilst there is tremendous pressure elsewhere is very difficult to defend" (Q 174). The CBI thought it was "difficult to see the added value of the Joint Research Centre activities, particularly in the context of the level of investment of funding in those organisations". They recommended that "other institutes, networks and technology organisations should be allowed to bid for the work content of the programmes ... wide publicity should be given to this opportunity and ... those organisations should be ... given the opportunity to bid on specific projects." They added, "to be fair, that process we believe has started, but it is moving very slowly, and we would like to see that particular thrust or initiative significantly accelerated" (Q 170). The CBI called for greater transparency in publishing the JRC's work programme, as an essential prerequisite to judging its effectiveness (Q 172). The 1995 Monitoring Panel commented, "Relatively little data are available by which to monitor the JRC's progress towards its objectives"; they also noted that JRC researchers have unusually long contracts.

2.82 A minority of the JRC's work is carried out directly for the Commission, to support it in its policy and regulatory functions. Professor Georghiou of PREST said that "in many countries, although not under current policy here [in the United Kingdom], it is considered legitimate for a Government or a ministry to have a laboratory which is able to provide independent advice. Indeed, many people in industry support that concept. They do not want potential competitors developing regulations and standards that affect them, for example. In those capacities therefore I believe that the Commission does have a legitimate argument. Those arguments do not apply though to the majority of its work which is taken out of the Framework Programme budget" (Q 117). He added that some longer-term monitoring duties, such as maintenance of databases and infrastructural activities, were probably best carried out in public sector laboratories (Q 118).

2.83 Professor Routti stressed that the JRC was going through a "rather challenging transition period", the outcome of which was hoped to be a smaller core JRC and a wider network of collaborating national research facilities—"a distributed Joint Research Centre". He pointed out that the "history of the European Communities started in the Steel and EURATOM exercise, and the Joint Research Centre was first established in those days. That mission has been completed, although there is still an important task to provide the safety criteria for nuclear power, for instance, on a European level. In today's world also I think there is a need to have a European reference laboratory and many questions related ... to food safety, environmental questions, let alone the more controversial issues of safety of weapons tests somewhere in the Pacific, would make it difficult for a national laboratory to address these questions. There is also a benefit of having an infrastructure where European scientists can work in a totally international environment on science projects. The Joint Research Centre has also formed close links with Eastern Europe. It is managing some of the programmes which are devoted to the conversion of defence industries into

civilian use" (Q 349). Plans to reduce or close any of the JRC's institutes would no doubt be resisted by its host country (QQ 115–6, 421).

2.84 The high profile of nuclear research in the JRC's work has been questioned (QQ 241–3). Professor Routti said that an independent evaluation of nuclear-related matters by experts appointed by Member States had recommended that the Framework Programme needed to maintain "about the current level of EURATOM activities" (Q 350). Mr Escritt, Director of Framework Planning in DG XII, said that this represented "roughly 30 per cent of the total Joint Research Centre activity, rather than the four-sevenths which might appear from the simple counting of the number of institutes" (Q 353).

DISSEMINATION AND EXPLOITATION

2.85 A succession of recent reports has repeated the truism that "it is one of the paradoxes of the European Union that despite its internationally acknowledged scientific excellence, it launches fewer new products, services and processes than its main competitors."²³ Inadequate translation of research results into commercial applications is seen as a major source of this problem.²⁴ Exploitation of research efforts has been identified as one of the priority areas for FP4; 2.7 per cent of the Budget, 330 MECU, is allocated to this area. By way of comparison, the Joint Research Centre was allocated 900 MECU, 7.3 per cent of the Framework Budget.

2.86 The OST called for 5 per cent of the FP5 budget to be allocated to the follow-through of research, and for exploitation plans to be built integrally into project proposals (p 17). The BBSRC said that the categorisation of dissemination as a separate activity in FP4 was "not optimal", and actions within specific programmes would be more effective. The development of industrial platforms in the Biotech programme had been a good example. There could be more funding within individual projects to enable researchers and their institutions to promote their findings and interact with industry and the public (p 116).

2.87 The CBI said that "much greater emphasis should be placed upon the outcomes and exploitation routes of Framework Programmes" (p 87). Mrs McNally MEP agreed (p 197): "the criteria for selection of participants in projects could include at least a reasonable attempt at showing the path to implementation of R&D results with particular reference to capital for innovation". The 1995 Monitoring Panel recommended "the active involvement of users throughout the programme lifecycle ... The IT and Telematics programmes are noted as particularly successful examples of user involvement". The Commission's recent *Action Plan for Innovation* (COM(96)589, 20 November 1996) includes a proposal to bring together the European Investment Bank and the Structural Funds to provide venture capital for innovation by firms in the less developed regions.

2.88 The Royal Academy of Engineering were particularly concerned for small firms. "The question ... of transferring new technology into SMEs is perhaps as important as encouraging them to be involved in doing pre-competitive research ... one of the problems we have in engineering is that we are simply not implementing enough of the things we know already and the transfer of technology into industry is not happening as widely as perhaps it should ... if something can be done within the European Commission's programme to facilitate this, perhaps using the analogy of our Teaching Company Scheme in the United Kingdom, that would be helpful particularly to SMEs" (Q 206).

EVALUATION, ASSESSMENT AND MONITORING

2.89 As noted above, *POST* goes into the question of evaluating the Framework Programmes in considerable depth. Its conclusions, though expressed in tones appropriate to a neutral body, are unfavourable: "Despite the efforts of the Commission and experts outside it, it is not clear that it is possible to select a number of evaluation techniques and state that they will correctly assess the impact of the Framework programmes, and provide information about possible future options. While economic indicators can give the broad context within which research and development is

²³ EU RTD 1996, p 16. This Committee will report on *The Innovation/Exploitation Barrier* during 1997.

²⁴ *Research and technology: FP4 (1994–98)*, European Commission, January 1995, p 12.

being carried out, and individual evaluations such as UKIMPACT or horizontal work can give ‘snap-shots’ of particular Member States or sectors, the current approach is very piecemeal and inconsistent, with results often depending on who is asking the questions” (*POST* 5.3).

2.90 *POST* also notes “the extent to which evaluations rely on Framework Programme participants to assess the value of the programmes from which they have benefited”. We can testify to this problem from our own experience of this inquiry: our witnesses have proved reluctant to criticise the goose which lays such golden eggs.

2.91 *POST* records the outcome of a “meta-evaluation” done by PREST in 1990 for the Commission: *The Impact and Utility of European Commission Research Programme Evaluation Reports*. Its conclusions were “generally positive about the composition, independence and methodology of the Commission’s evaluations, as well as a high take-up of the suggestions included in these ‘meta-evaluations’. The main deficiencies of the evaluation reports so far were the lack of dissemination of the reports and their results to Member States and programme participants, in addition to the length of the evaluations which, combined with a lack of executive summaries, made them difficult to read and unattractive. There were also problems to do with timing (with follow-on programmes being decided before evaluations had been completed), inadequate attention being paid to policy consideration, particularly those relating to regulations, and the need to interview non-participants in programmes to gain an alternative view” (*POST* 5.2.4).

2.92 *POST* makes some recommendations of its own. It suggests that the Commission could take lessons in evaluation of research from the DTI: it should expand its evaluation unit and widen its remit to include the activities of other DGs besides DG XII, adopt a more coherent strategy along the lines of the approach known in the DTI as “ROAME”, and get beyond its own programme managers to talk to researchers themselves (*POST* 5.3). “More effective and flexible procedures for evaluation are also needed during the programmes in a timescale which can inform ‘mid-course’ corrections ... the system should ensure that:

- the selection of the members of the evaluation panel is transparent
- the members of the panels are drawn from as large a ‘pool’ as possible
- the panel members are involved in the evaluation process from the very beginning, i.e. they need to take part in the drafting of any questionnaires/interviews which will be used to collect raw data for evaluation
- a realistic time-frame needs is in place, so that participants have time to reply, and the panel members have time to carry out their evaluation effectively” (*POST* 6.7).

2.93 The 1995 Monitoring Panel also made specific recommendations for evaluation. They called for a system of performance indicators, applicable consistently to all programmes. “Examples of basic indicators should include overall expenditure, management costs, and numbers of students, PhDs, publications and patents.” The Commission replied, “The Commission Services fully accept this recommendation and have set about co-ordinating the collation of new and existing performance indicators through the recently established Inter-Service Group on Monitoring and Evaluation. Furthermore, a project commissioned at the start of 1996 with two groups of external evaluation experts should provide some additional advice on possible project level performance indicators”. Tim Gatland (p 186) sounded a warning about use of milestones: “This leads project teams to retain focus in unfruitful areas (which might have appeared relevant at the start of the project) and to achieve milestones in those areas, at the expense of more applicable work”.

CHAPTER 3 OPINION OF THE COMMITTEE

FOCUS OF THE FRAMEWORK PROGRAMME

3.1 There is general agreement (see above, paragraphs 2.1–7) that the first four Framework Programmes have suffered from too many objectives and too little focus. We recognise that this is a consequence of political life in a European Union with an expanding number of Member States, each with different political priorities and research needs, and indeed of life in a Commission of competing Directorates-General, each with its own agenda for research. The result has been that Framework funds have been spread too widely.

3.2 In the Committee's view, **the single most important reform which is needed for the Fifth Framework Programme is for it to be focused on a smaller range of subjects, and within each subject on a smaller range of better-defined programmes**. This will enable more to be done in the areas selected; it will simplify administration; and it may reduce the number of unsuccessful applications for Framework funding, with all the attendant waste of resources. It will certainly require hard decisions, since programmes from FP4, which are of continuing merit but which do not match the themes of a more focused FP5, will require to be closed down; the Government should encourage the Commission to be rigorous in this respect.

3.3 The Commission has repeatedly signalled its intention to exercise greater selectivity in its choice of Framework topics, most recently in *Towards FP5* 2, which commits FP5 to "a particular effort of selectivity and concentration on a limited number of areas and objectives". We are therefore astonished to see that the Key Actions and general activities proposed in the very same document (see above, paragraph 1.21) appear to reproduce all the programmes of FP4, as well as introducing new topics (e.g. food, water, multimedia contents, aeronautics, city of tomorrow). Although arranged into just three thematic programmes, the programme envisaged by the Commission is all-embracing; indeed we would challenge the Commission to name an area of research which could not find a place in one of its categories. Far from being a selective programme to complement and add value to the research programmes of Member States, the Commission's programme is of appropriate scope for the national programme of a leading scientific nation. **We urge the Government to make every effort in the Council of Ministers to force the Commission to honour its commitment to a more focused Programme; to this end, some of the activities of FP4 must be explicitly terminated.**

3.4 It is not enough to agree that there must be focus; it must also be agreed what that focus is to be. The Commission proposes, as the leading criterion for selection of programmes, "high European value added" (see above, paragraph 1.19). This could mean various things: subjects with a general European dimension, or matters related to EU policies, or research whose applications could be Europe-wide. In the light of the prevailing doctrine of subsidiarity, we agree with the OST (paragraph 2.5) that none of these is sufficient justification for action at EU level. We had many discussions about the differences between themes appropriate for national, European and global research programmes and were unable to find any clear basis for distinguishing between them, apart from the obvious principle that research required by the Commission to support its executive and pre-legislative functions must be paid for out of the Commission's budget. The benefits of the Framework Programme to Europe lie more in promoting collaboration between scientists and laboratories in different countries, which has been one of the undoubted successes of the programme (paragraphs 2.21–23).

3.5 The choice of focus must therefore be a matter for intelligent political decision, informed by perceptions of the social needs and scientific opportunities of the next five years. We recommend no particular agenda. However we recommend that, **whatever agenda is chosen, it should play to the strengths of European research and development, with a view to maximising the achievements, and the return on the achievements, of Europe's best researchers and centres of scientific excellence.**

3.6 While we support international scientific collaboration beyond the borders of Europe, we consider that the Commission's proposals for "Confirming the international role of European research" envisage too wide a range of collaborations. They appear to extend the possibility of involvement in Framework programmes to far too many countries. Without greater

selectivity, the Commission risks further dissipating the resources of the Framework Programme, and exposing an agenda supposedly built upon Europe's needs to the risk of serious distortion.

3.7 We note the Commission's intention that FP5 should aim not only at technical achievement, but at meeting socio-economic need (see above, paragraph 2.10). Such an emphasis will no doubt help to commend FP5 to the European taxpayer. However history provides many examples of research money being wasted on problems which were urgent, but where science was not ready to provide solutions. The Government should not allow the Commission to fall into this trap.

3.8 One area in which FP5 might offer real "value added" is in support for large scientific facilities. There is a range of installations, from neutron sources to wind tunnels, which are essential to researchers in particular fields but whose capital and running costs may be beyond the resources of any single institution and even those of most single states. "Big science" has its dangers: proposals may be motivated simply by the desire for funding on a grand scale, and may be agreed to for reasons of prestige rather than on the basis of need. Supporting greater use of an existing facility, as does the TMR Large Scale Facilities Programme in FP4, may be a better use of resources than the construction of a new one. Provided that these considerations are borne in mind, this is a line of possibilities which the Commission might do well to explore. **We therefore welcome the proposal in *Towards FP5* 2 that each programme in FP5 should include support for research infrastructure.**

3.9 **We support the Commission's proposal (paragraph 1.19) for a contingency fund or "free space" in FP5, to allow the focus to be sharpened or shifted as the Programme unfolds.** In our view this will be a better way of dealing with contingencies than the procedure whereby the Commission's bid for 700 MECU of extra money for FP4 has been whittled down to 100 MECU in negotiations which have dragged on for over a year and are still continuing (paragraph 1.12). 35 MECU of this is to go to research into transmissible spongiform encephalopathies, a genuinely urgent problem with Europe-wide implications in need of research; but a contingency fund would provide a much better way to respond to such emergencies. **Calls on the contingency fund must meet the same criteria as all other proposals; in addition it will have to be demonstrated that the research proposed is urgent, and that the need and opportunity for it were unforeseeable when FP5 was drawn up.** There must be sufficient control for it to be impossible to use the contingency fund to cover up mismanagement of other programmes.

VALUE FOR MONEY

3.10 Despite much dissatisfaction with the way the Framework Programme is run (see below), our witnesses generally support its continued existence, and so do we. However, we do not consider there to be a distinctive EU scientific agenda beyond the needs of the Commission; and we believe that similar outcomes could have been achieved by spending the same amounts of money at national or global level. National schemes start with the advantage of costing less in travel and translation. However it is our own experience and that of our witnesses that **EU research funding offers substantial (though unquantifiable) added value by encouraging both universities and firms to collaborate and share knowledge across Europe's frontiers.** Such encouragement was available before the Framework Programmes, for example through NATO, the European Science Foundation and the Royal Society; but the Framework Programmes offer much greater resources.

3.11 Although the Training and Mobility of Researchers programme (paragraph 1.35) is one of the smallest parts of FP4 in terms of funding (six per cent), our witnesses spoke warmly in its favour. We agree: **the Training and Mobility of Researchers programme, with its focus on people rather than projects, is one of the most valuable parts of the Framework Programme, and one which is in full accord with the principle of subsidiarity. For FP5, the coverage of TMR should be increased, for instance by reducing the minimum size of collaborative groups. The process of selection should be improved:** selectors should be named; external referees should be used; and unsuccessful applicants should be notified promptly.

3.12 For United Kingdom researchers, as well as for the British Government, there is good reason for wanting the Programmes to continue, since British universities and companies have been

major beneficiaries; and European networks built up by the Framework Programmes complement the long-standing scientific relationships between the United Kingdom and the USA. However in one practical way, Framework grants to United Kingdom universities carry a cost which, in an extreme case, might outweigh the benefit: this is the matter of inadequate provision for the full costs associated with funded posts (paragraph 2.25). This is a real problem for United Kingdom universities, and does not enhance the standing of the Framework Programme; were a university to be too successful in winning Framework contracts, it might bankrupt itself. **For FP5, funding for academic posts should be set at a more realistic level as regards associated costs, with appropriate audit controls.** Another factor working against the benefits of the Framework Programmes to the United Kingdom is attribution; we consider this below.

EVALUATION, ASSESSMENT AND MONITORING

3.13 We freely admit that our conclusions on the value for money represented by the Framework Programmes rest largely on anecdotal evidence. Consideration of value for money, and indeed of most of these issues, is bedevilled by inadequate systematic evaluation of the Framework Programmes so far (see above, paragraphs 2.89–93). Framework Programmes 1–4 will have cost 28,000 MECU (£21 billion), and the European taxpayer is entitled to evidence that this large sum has been well spent. The Annual Monitoring Report is a valuable innovation; but by its own admission it concentrates on administration, and has little to say about scientific quality and results. **We recommend that improved evaluation systems be put in place for FP5, based on best practice in the United Kingdom and other Member States.** This will include cost-benefit analysis, and where appropriate targets and milestones; but, in the case of more fundamental research, setting outcome targets may be by definition impossible.

BASIC RESEARCH

3.14 We have listened to much discussion as to whether Framework research should be basic, strategic-basic, applied-strategic, pre-competitive or near-market (paragraphs 2.27–30). We are inclined to agree with the Commission that this discussion is not fruitful; even if the blue sky and the market are usually two separate points between which may be discerned a line, which we do not necessarily admit, the line is sometimes so short, that in the time taken to decide where to start injecting funds and where to stop the opportunity may be lost. Therefore we do not support the Royal Society's proposal that 10 per cent of each programme budget should be for basic research; neither do we agree with the OST that basic research should be excluded from the remit of the Framework Programmes altogether.

3.15 Instead we commend to the Commission the model of the United Kingdom Research Councils. Since *Realising our Potential*, the Science White Paper of 1993 (Cm 2250), each Council has had a "mission statement", dedicating it to meeting the needs of specified "users" and to enhancing competitiveness and quality of life. However each Council's mission includes support for basic research and for "the full range of underpinning disciplines". The White Paper said, "The Government does not wish to run the risk of separating basic researchers from those who are concerned with application; rather it wishes the whole effort to be brought into closer contact with potential users. It therefore favours Research Councils which are able to identify areas for cross-fertilisation and integration along the continuum of basic, strategic and applied research" (paragraph 3.18). Those were wise words, and the Government should commend them to the Commission: **any part of the FP should be permitted to fund basic research to any level, if that research underpins the objective of the programme.** We therefore welcome the proposal in *Towards FP5* 2 that each programme in FP5 should permit unlimited support for "generic technologies and basic research". **The Programme must also allow for long-term funding,** though not to the extent that decisions made under one five-year plan effectively commit resources available under the next.

COHESION

3.16 Our evidence supports Sir William Stewart's bald assertion that "Cohesion has been used to justify mediocrity" (paragraph 2.32), and lends credence to the widely-held belief that researchers can improve their chance of securing EU funds simply by involving someone from a "cohesion country" in their proposal. Making cohesion an objective of the Framework Programmes takes resources away from the best and most necessary research; it smacks of tokenism, which patronises the people it purports to help and brings the Programme into disrepute; and it further

weakens the weaker countries by discouraging them from setting their own research agenda. Cohesion in terms of R&D capacity is a proper objective for the EU, but is more appropriately served by the Structural Funds. We recommend that the explicit objective of fostering research capacity in the less developed regions of the EU be entrusted exclusively to the Structural Funds, and omitted from the mission of FP5, save in respect of activities in the fields of training-and-mobility and dissemination. With respect to the Training and Mobility of Researchers programme, researchers from less developed regions should not be preferred above others in the selection procedure merely by virtue of their home address; but, if successful on merit, it is right and helpful that they should benefit from the specific "top-up" measures noted above (paragraph 1.45), e.g. an extra year's grant on return home. Less developed regions are also a legitimate target for dissemination activities (see below).

SMALLER FIRMS

3.17 Some smaller firms are well connected to the R&D activities of their larger customers; these will have no special difficulty joining the "mother" firm in a Framework collaboration, and do not require special measures. But many smaller firms not so securely fixed in a supply chain are ill-equipped and insufficiently staffed to undertake research; and it will be hard to reconcile additional effort to involve such firms with the overriding aim of improved focus (paragraphs 2.36–38). **Rather than diverting resources from the Framework Programme's main thrust in an attempt to involve such firms, the Programme should concentrate on assisting them through research fellowships and through improved dissemination of research results.**

TASK FORCES

3.18 Our witnesses criticised the manner in which the Commission set up the Task Forces in 1995, and the initial choice of Task Force themes (paragraphs 2.39–44); but they generally welcome the Task Force concept itself, and so do we. **The device of highly focused groups, working to improve communication between the Commission's resources, the scientific and industrial communities and the needs of users, should be developed in FP4 and carried forward into FP5.** We agree with the OST and most of our witnesses that the Task Forces should be developed into advisory groups, rather than into management committees with their own budgets; this way, they are likely to contribute to the main aim of focusing the Framework Programme without further complicating the administrative structure (see below).

ADMINISTRATION

3.19 Several of our witnesses expressed a high opinion of the Commission staff working on the Framework Programmes (see above, paragraph 2.63); but their collective opinion of the administrative procedures of the Programmes could scarcely be lower. This comes as no surprise; the Framework Programmes have long been notorious in the United Kingdom scientific community for their exasperating inefficiency. The litany of complaint is as familiar as it is comprehensive: the cost of administration is unacceptably high (paragraph 2.45); the failure rate of applications for funding is unacceptably high, in some programmes if not in all (paragraph 2.47); the peer review process is too centralised, too slow and too secretive, and its outcomes do not always command confidence (paragraph 2.52); once a grant has been awarded, the time from award to contract is too long (paragraph 2.57); and the Commission suffers from poor internal financial audit (paragraph 2.46), poor internal communication (paragraph 2.58) and inadequate delegation (paragraph 2.62). In consequence, the resources of both the Commission and those dealing with it are wasted, and the Framework Programmes and the EU as a whole are brought into disrepute.

3.20 We do not doubt that Professor Routti and his colleagues are painfully aware of the shortcomings of the systems which they have inherited, and are determined to put things right (paragraph 2.67). **We recommend root and branch reform of the business processes of DG XII, as sketched for us by Professor Georghiou of PREST (paragraph 2.69), in time for the start of FP5.** In addressing the process of peer review, the Commission should take advice from national research funding organisations, such as the United Kingdom Research Councils, and international bodies such as the European Molecular Biology Organisation.

3.21 Behind much of the inefficiency of the Framework Programmes lie two of their fundamental features: centralisation, and lack of focus. **For FP5, we recommend that the**

management and evaluation of programmes should involve individuals and national or international organisations closer to the actual conduct of the research, including representatives of research-led industry (paragraph 2.68). The question of focus has already been dealt with (paragraph 3.2).

VAT

3.22 United Kingdom universities are currently the innocent victims of a disagreement between Customs and Excise and the Commission about VAT and Framework research contracts (see above, paragraph 2.70). **We urge them to settle this dispute promptly so as to enable the universities to recover VAT from one side or the other in the usual way.** The OST told us in November 1996 that "this problem should disappear very shortly"; we are surprised that it remains unresolved.

ATTRIBUTION

3.23 The United Kingdom's unique policy of attribution (see above, paragraph 2.72) is intellectually respectable; but its effects on British behaviour in respect of the Framework Programme are perverse. Each Government Department seeks to minimise the effect of attribution on its budget baseline by having as little to do with the Programme as possible; in the Council of Ministers, while other Member States bid eagerly for what they perceive as extra money, Her Majesty's Minister prefers to talk down sums which the Treasury will take from his budget; in the scientific community, it is widely believed that every penny won in Brussels is liable to be clawed back by Whitehall.

3.24 It is in the United Kingdom's interest, and that of Europe as a whole, that we should be enthusiastic champions of the Framework Programmes (see above, paragraph 3.10); though we acknowledge the rationale of attribution, the Government must face the fact that in this respect they may be "the only one in step". **We call on the Government to reconsider the policy of attribution in the light of the perverse effect noted above, and of the policies of other Member States, and to consider whether attribution as applied to research expenditure should be modified in time for FP5, so as to give those negotiating for the United Kingdom an interest in success rather than in failure.**

JOINT RESEARCH CENTRE

3.25 The concept of protected funding for a large corporate research laboratory is outmoded, and neither we nor most of our witnesses (paragraph 2.79) can see any justification for the continuation of the Joint Research Centre (JRC) in its present form. It is evidently a legacy of EURATOM, and its mission has been allowed to drift beyond recall. A considerable part of the JRC's activities are still related to nuclear research and safety, and the relevance and the scope of this need review.

3.26 While there may be a requirement for a small "in house" research capacity to support some of the Commission's activities, most of the advice and research needed by the Commission and the Parliament could be more effectively and economically carried out on a contract basis with national institutions including universities. The list of JRC activities provided by the Commission (p 192) is worthy, but most of it amounts to data collection and analysis which could be carried out by any one of a number of research units around Europe working in the relevant field, without risk to quality or integrity. **The JRC's directly-funded core operations should be confined to the few matters where a distinctively EU view of the questions involved is essential.**

3.27 At present less than 20 per cent of the JRC's finances are subject to competitive tender and indeed most of this part of the JRC's activities are commissioned by Directorates of the Commission. We can see no justification for the current level of ring-fencing of the JRC's finances. **We recommend that the work of the JRC should be open to competition, to peer review and to assessment by an independent group.**

3.28 The evidence which we received during our inquiry led us to believe that the Commission was already moving in this direction. We are therefore most concerned to read in *Towards FP5 2*, "the institutional and operational role of the JRC in implementing FP5 would be at least on a par with its role in FP4". This endorsement of the status quo, unsupported by scientific justification, reveals the same inertia as the continuity of scientific programmes from one Framework to the next.

The role of the JRC in FP5 should depend on its success in open competition, not on any unconditional prior commitment.

DISSEMINATION AND EXPLOITATION

3.29 While new knowledge is valuable for its own sake, everyone involved in research hopes for outcomes which can be applied and exploited, either to create wealth or to improve the quality of life or both. Yet we note evidence (paragraph 2.85) that dissemination and exploitation have been weak in FP4. **The Commission are right to envisage dissemination and exploitation as an important "horizontal activity" in FP5, concentrating on smaller firms (see above, paragraph 3.17) and less developed regions.** We urge them to consider the advice of several of our witnesses that, where appropriate, research proposals should chart the pathway to exploitation of the outcomes. This would involve a requirement to address from the start the difficult but vital question of intellectual property arising from the collaboration, and the equally important question of venture capital or "seed capital". **We welcome the proposal in *Towards FP5 2* to address the problem of venture capital for technological innovation.** Of course, Framework funds themselves must not be diverted into venture capital; and what is proposed must not duplicate existing activities of DG XIII. In this connection, we draw attention to our forthcoming report on the *Innovation-Exploitation Barrier*.

3.30 This presupposes, of course, that the outcomes of Framework-funded research are worthy of dissemination and fit for exploitation. We have noted already our doubts as to the overall worth of the outcomes to date, in the absence of reliable evaluation.

3.31 It is unhelpful for the Commission to have one Directorate-General responsible for research and another for exploitation of research (paragraph 2.58). This problem is compounded by the fact that the former DG is based in Brussels, and the latter in Luxembourg, thereby rendering impossible regular informal contacts of Commission officials based in the two DGs. **We recommend that responsibility for exploitation should be united with responsibility for research in time for the start of FP5.**

CONCLUSION

3.32 We support the Framework Programmes; and we consider that the extra cost of R&D collaboration across frontiers is worth paying. But the value for money represented by EU research activities must be improved, and must be demonstrated by better evaluation. From FP5 the Government should look for a higher overall standard of scientific outcomes, leading to a better record of industrial exploitation.

3.33 We are grateful to Professor Routti and his colleagues for their co-operation in this inquiry. However we are dismayed by the approach to FP5 set out in *Towards FP5 2*. Where the Commission promised focus and selectivity, they offer instead a programme of vast scope and unlimited geographical extent; they promised a reduced role for the JRC, but now it appears that its role is to be maintained or enhanced. **The United Kingdom and the European Union have much to gain from FP5. All those involved in the negotiations over the coming months need to work together to ensure that the Programme is focused, adequately resourced, properly managed on the basis of uniformly open competition, and capable of meeting the needs and opportunities of the future.**

CHAPTER 4 SUMMARY OF CONCLUSIONS

4.1 The single most important reform which is needed for the Fifth Framework Programme by comparison with previous Framework Programmes is for it to be focused on a smaller range of subjects, and within each subject on a smaller range of better-defined programmes (paragraph 3.2). We urge the Government to make every effort in the Council of Ministers to force the Commission to honour its commitment to a more focused Programme; to this end, some of the activities of FP4 must be explicitly terminated (paragraph 3.3).

4.2 Whatever agenda is chosen for FP5, it should play to the strengths of European research and development, with a view to maximising the achievements, and the return on the achievements, of Europe's best researchers and centres of scientific excellence (paragraph 3.5).

4.3 While we support international scientific collaboration beyond the borders of Europe, we consider that the Commission's proposals for "Confirming the international role of European research" envisage too wide a range of collaborations (paragraph 3.6).

4.4 We welcome the proposal in *Towards FP5 2* that each programme in FP5 should include support for research infrastructure (paragraph 3.8).

4.5 We support the Commission's proposal (paragraph 1.19) for a contingency fund or "free space" in FP5, to allow the focus to be sharpened or shifted as the Programme unfolds. Calls on the contingency fund must meet the same criteria as all other proposals; in addition it will have to be demonstrated that the research proposed is urgent, and that the need and opportunity for it were unforeseeable when FP5 was drawn up (paragraph 3.9).

4.6 We do not consider that there is a distinctive EU scientific agenda, beyond the needs of the Commission. However we are persuaded that EU research funding offers substantial (though unquantifiable) added value by encouraging both universities and firms to collaborate and share knowledge across Europe's frontiers (paragraph 3.10).

4.7 The Training and Mobility of Researchers programme, with its focus on people rather than projects, is one of the most valuable parts of the Framework Programme. For FP5, the coverage of TMR should be increased, and the process of selection improved (paragraph 3.11).

4.8 For FP5, funding for academic posts should be set at a more realistic level as regards associated costs, with appropriate audit controls (paragraph 3.12).

4.9 We recommend that improved evaluation systems be put in place for FP5, based on best practice in the United Kingdom and other Member States (paragraph 3.13).

4.10 Any part of the Framework Programme should be permitted to fund basic research to any level, if that research underpins the objective of the programme. We therefore welcome the proposal in *Towards FP5 2* that each programme in FP5 should permit unlimited support for "generic technologies and basic research". The Programme must also allow for long-term funding (paragraph 3.15).

4.11 Cohesion in terms of R&D capacity is a proper objective for the EU, but is more appropriately served by the Structural Funds. We recommend that the explicit objective of fostering research capacity in the less developed regions of the EU be entrusted exclusively to the Structural Funds, and omitted from the mission of FP5, save in respect of activities in the fields of training-and-mobility and dissemination (paragraph 3.16).

4.12 Rather than diverting resources from the Framework Programme's main thrust in an attempt to involve smaller firms, FP5 should concentrate on assisting them through research fellowships and through improved dissemination of research results (paragraph 3.17).

4.13 The device of highly focused groups, working to improve communication between the Commission's resources, the scientific and industrial communities and the needs of users, should

be developed in FP4 and carried forward into FP5. The Task Forces should be developed into advisory groups, rather than into management committees with their own budgets (paragraph 3.18).

4.14 We recommend root and branch reform of the business processes of DG XII, in time for the start of FP5. The management and evaluation of programmes should involve individuals and national or international organisations closer to the actual conduct of the research, including representatives of research-led industry (paragraphs 3.20–21).

4.15 We urge Customs and Excise to settle their dispute with the Commission promptly so as to enable the universities to recover VAT from one side or the other in the usual way (paragraph 3.22).

4.16 We call on the Government to consider whether attribution as applied to research expenditure should be modified in time for FP5, so as to give those negotiating for the United Kingdom an interest in success rather than in failure (paragraph 3.24).

4.17 The Joint Research Centre's directly-funded core operations should be confined to the few matters where a distinctively EU view of the questions involved is essential. We recommend that the work of the JRC should be open to competition, to peer review, and to assessment by an independent group. The role of the JRC in FP5 should depend on its success in open competition, not on any unconditional prior commitment (paragraphs 3.26–28).

4.18 The Commission are right to envisage dissemination and exploitation as an important “horizontal activity” in FP5, concentrating on smaller firms and less developed regions. We welcome the proposal in *Towards FP5 2* to address the problem of venture capital for technological innovation (paragraph 3.29).

4.19 We recommend that responsibility within the Commission for exploitation of research outcomes should be united with responsibility for research in time for the start of FP5 (paragraph 3.31).

4.20 We support the Framework Programmes; and we consider that the extra cost of R&D collaboration across frontiers is worth paying. But the value for money represented by EU research activities must be improved, and must be demonstrated by better evaluation. From FP5 the Government should look for a higher overall standard of scientific outcomes, leading to a better record of industrial exploitation.

4.21 We are grateful to Professor Routti and his colleagues for their co-operation in this inquiry. However we are dismayed by the approach to FP5 set out in *Towards FP5 2*. Where the Commission promised focus and selectivity, they offer instead a programme of vast scope and unlimited geographical extent; they promised a reduced role for the JRC, but now it appears that its role is to be maintained or enhanced. The United Kingdom and the European Union have much to gain from FP5. All those involved in the negotiations over the coming months need to work together to ensure that the Programme is focused, adequately resourced, properly managed on the basis of uniformly open competition, and capable of meeting the needs and opportunities of the future.

APPENDIX 1

Members of the Sub-Committee who conducted the enquiry

Lord Butterworth
Lord Craig of Radley
Lord Gregson
Lord Haskel
Lord Lewis of Newnham
Lord Nathan
Lord Phillips of Ellesmere
Baroness Platt of Writtle
Lord Porter of Luddenham
Earl of Selborne (Chairman)
Lord Soulsby of Swaffham Prior

The Sub-Committee appointed as its Specialist Adviser:

Sir Arnold Burgen FRCP FRS

APPENDIX 2

List of witnesses

The following witnesses gave evidence. Those marked * gave oral evidence.

- * Biotechnology and Biological Sciences Research Council
Dr J Borgman, European Science and Technology Assembly
- * Committee of Vice-Chancellors and Principals
- * Confederation of British Industry
- * Economic and Social Research Council
Engineering and Physical Sciences Research Council
Mr Tim Gatlard
- Industry, Research and Development Advisory Committee
- Institution of Civil Engineers
- Joint Research Centre
Lord Kennet
- Loughborough University
Mrs Eryl McNally MEP
- Medical Research Council
Natural Environment Research Council
- * Office of Science and Technology
- * Policy Research in Engineering, Science and Technology
- * Sir Dai Rees
- * Professor Jorma Routti, Director General, DG XII, European Commission
- * Royal Academy of Engineering
Royal Society
Royal Society of Chemistry
- * SmithKline Beecham Pharmaceuticals (oral evidence with CBI)
- * Sir William Stewart
Treasury
University of Edinburgh
University of Leeds

APPENDIX 3

Invitation to submit evidence

The Sub-Committee invites written submissions on matters of relevance to this topic, but in particular on the questions listed below.

Direction

1. What lessons should be derived from the Fourth Framework Programme?
2. Should there be a Fifth Framework Programme? If so, what should be the main objectives or focus and how should the priorities be set?
3. What should be the balance between basic and applied, pre-competitive, and near-market research funded through a Fifth Framework Programme?
4. What should be the role of Task Forces in a Fifth Framework Programme?
5. Can it be demonstrated that the UK gets clear value for money from participation in the Framework Programme and, in particular, what has been the impact on industrial competitiveness, social and economic sectors?

Priorities

6. What should be the role and priorities of the Joint Research Centre, and how should its activities be funded?
7. How should the EU meet its 'cohesion objective' of enabling SMEs and Member States with less scientific expertise to benefit from the Framework Programme, while ensuring that the highest scientific standards for EU research are met?

Funding and administration

8. Does the European Commission have the adequate expertise and the mechanisms to support the Framework Programme?
9. Is the current length of Framework Programmes too long and would they benefit from shorter time frames with more flexible funding? Alternatively, should the Programmes be longer?
10. Should Task Forces have ear-marked funds to support their own research programmes?
11. How should the UK allocate funding for the Framework Programme and other EU research initiatives to ensure that UK researchers are not disadvantaged?

APPENDIX 4

Acronyms

BBSRC	Biotechnology and Biological Sciences Research Council
CBI	Confederation of British Industry
CRAFT	Cooperative Research Action for Technology
CREST*	Scientific and Technical Research Committee
CVCP	Committee of Vice-Chancellors and Principals
DG	Directorate-General (of the Commission of the European Communities)
DTI	Department of Trade and Industry
ECU	European Union unit of account: in February 1997 £1 = 1.39 ECU, 1 ECU = £0.72
EMU	Economic and Monetary Union
EPSRC	Engineering and Physical Sciences Research Council
ESF*	European Science Foundation
ESRC	Economic and Social Research Council
ESTA*	European Science and Technology Assembly
EU	European Union
FP5	Fifth Framework Programme
GDP	Gross domestic product
IRDAC*	Industrial Research and Development Advisory Committee
JET	Joint European Torus
JRC	Joint Research Centre
MECU	Million ECU
MEP	Member of the European Parliament
NERC	Natural Environment Research Council
OECD	Organisation for Economic Co-operation and Development
OST	Office of Science and Technology
POST	Parliamentary Office of Science and Technology
PREST	Policy Research in Engineering, Science and Technology (University of Manchester)
RAEng	Royal Academy of Engineering
RTD	Research and technological development
SET	Science, engineering and technology
SMEs	Small and medium-sized enterprises
TMR	Training and Mobility of Researchers
TSER	Targeted Socio-Economic Research
UNICE	Union of Industrial and Employers' Confederations of Europe (French)

* See Appendix 6

APPENDIX 5

European research policy institutions

- COST Scientific and Technological Committee, set up by the Member States of the EEC in 1970 to co-ordinate national research priorities. It includes non-Member States. In December 1995 it had 25 members and 125 projects. See *POST 2.1*.
- CREST Scientific and Technical Research Committee, set up by the EEC in 1974 to co-ordinate national research priorities. Its members represent the national research ministries.
- ESF European Science Foundation, set up in 1974 to oversee developments in basic research. Its members are research councils and academics from around Europe, including non-Member States.
- ESTA European Science and Technology Assembly, set up in 1994. It brings together 100 scientists, chosen by the Commission, to advise on EU RTD policy. Successor to CODEST (Committee for the European Development of Science and Technology).
- EUREKA An intergovernmental institution set up in 1985 in response to the US Strategic Defense Initiative, to encourage collaborations across Europe in near-market R&D.
- IRDAC Industrial Research and Development Advisory Committee, set up by the EEC in 1984 to give industrial input to EU RTD policy. Its members are appointed by the Commission from industrial and trade union organisations.



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ISBN 0 10 404997 9